

## OFFICIAL CONFERENCE PROCEEDINGS

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#### Intergenerational Social Perceptions of the Energy Context as Based for Designing Educational Structures That Promote Sustainability and High Social Participation

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#### Abstract

To support the Sustainable Development Goals (SDGs) proposed by the United Nations, several important aspects are required, among which the active participation of society in initiatives and project development can be highlighted. In particular, the social perception of the energy sector can be understood as the social opinion related to the acceptance, appropriation, and social trust regarding the actions developed by the private and public sectors in the energy framework. Given the above, a quantitative and exploratory study has been carried out on the intergenerational social perception of the energy context, to obtain results that will allow the identification of starting points for improving the formal, informal, and non-formal structure of social education on sustainability (particularly concerning the energy sector and energy poverty) for different segments of the population, namely the Centennials, Millennials, Generation X and Baby Boomers. An important result to highlight is that the public opinion of citizens belonging to the Centennial Generation is extremely representative. Meanwhile, the opinions of previous generations, such as Generation Millennials, Generation X, and Generation Baby Boomers, have less influence on public opinion. Finally, this research also addresses the challenges and opportunities regarding the development of interdisciplinary educational projects to improve the energy indicators of the region considering the intergenerational aspects.

Keywords: Community & Society, Education, Sustainability & Society, Social Justice, Development & Political Movements

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#### Introduction

The generation, transmission, and distribution of electrical energy are undoubtedly vital to various important aspects of society's development. In general, the creation of jobs in certain sectors of the manufacturing industry requires a public and/or private service of constant and high-quality electrical energy. In the healthcare sector, for example, electrical energy is crucial, as medical equipment needs to be constantly running due to vaccines need to be almost frozen. For these reasons, there are many technological advances in the energy sector, from those based on conventional energy sources (e.g. coal, natural gas) to those based on renewable energy sources (e.g. wind, solar, etc.) (Kaygusuz, 2012; Khan et al., 2020).

However, in addition to the technological challenges, the energy sector also faces social barriers. These challenges are related to society's trust in energy projects, people's emotional and cultural appropriation, and other aspects that include social opinion on energy sector developments. In fact, there have been social problems related to energy projects around the world, most of them based on disagreements and/or misinformation (see Figure 1) (Cuppen, 2018; Ibar-Alonso et al., 2022).



Figure 1: Rally of People Due to Social Problems Source: https://freerangestock.com/sample/108370/large-group-of-people-holding-signs-in-aprotest.jpg (CC0 1.0 DEED)

Therefore, it is important to approach the relationship between energy sector projects and society's perspectives from a non-technical point of view, i.e. socio-demographic aspects should be taken into account in all locations to communicate the best way to inform about energy sector projects, their advantages, disadvantages, risks and their management (Schmidt and Weigt, 2015). A particular aspect of this approach is the different generations that make up a society. That is, people of different ages who, due to various factors, have different opinions and perspectives on a unique event, in this case, energy sector projects and their management (Grossmann, 2019; Radtke & Ohlhorst, 2021). In this manner, this investigation considers social perception from aspects related to the energy sector, including the following age categories: 1) Gen-Z, also called Centennials (1995–2009), 2) Gen-Y, Millennials (1980–1994), 3) Gen-X (1965–1979), and lastly, 4) Baby boomers gen, Gen-BB (1946–1964).



Figure 2: Adult Education Programs Source: https://live.staticflickr.com/3308/3546874366\_5edd55f72e\_c.jpg (CC BY-NC-ND 2.0 DEED)

The last point allows us to define the starting point for the creation of a formal, informal, and non-formal educational organization aimed at a specific market segment defined by the age generations already mentioned, intending to share with all people all aspects related to the management and projects of the energy sector located in their locality (see Figure 2). In addition, what has been mentioned above is framed on the novel educational frameworks promoting the participation of cities concerning the Sustainable Development Goals (SDGs) proposed by the United Nations (Elice et al., 2023; Melnic & Botez, 2014).

In this way, we've proposed various questions to continue the research, such as, what is the level of trust that citizens of different generations have in the management of public and private projects in the energy sector? Are there any patterns of behavior between generations in terms of the trust placed in the private and public sectors? And, what are the educational proposals to initiate a social change in terms of trust in energy sector projects?

#### Methodology

This research has been developed taking into account the analytical questions mentioned above. A tool (survey) has been created with 14 single and multiple-answer questions on society's trust in renewable energy projects, energy sector management, and energy poverty. In the case of this research, only the questions relating to trust in society are relevant. This tool also includes 3 questions about demographic information, such as gender, age, and highest school grade obtained. The survey of this research was carried out in the first half of 2023 in the municipality of Ensenada, México, on 402 people through different digital platforms. It's important to mention that the tool was formulated, revised, and verified by 6 people directly involved in the energy sector, all specialized in renewable energy. Following the application of the research survey, the data were analyzed as a whole, and different results were obtained from the questions and objectives of the research. In this case, this document only shows the research findings related to the intergenerational social perceptions of the energy context as a basis for designing educational structures that promote sustainability and high social participation.

#### **Results and Analysis**

Table 1 shows the demographic information from people's responses. It can be seen that Z Gen people represent 72.39% of the respondents, while BB Gen represents only 1.24%. The percentages of X and Y Gen are 10.70% and 15.67%. It's important to note that the fifth column of Table 1 represents the percentage of each generation based on a government census from the National Institute of Statistics and Geography (INEGI in Spanish), which indicates a potential limitation that will be addressed in the limitations section.

Table 1: Age				
Generations	Age range	Amount	%	% INEGI
Z, Centennials (1995–2009)	14 - 28	291	72.39	33.57
Y, Millennials (1980–1994)	29 - 43	63	15.67	29.33
X(1965–1979)	44 - 58	43	10.70	22.96
BB (1946–1964)	59 - 77	5	1.24	14.14
		402	100.00	

Concerning the question of trust in the private sector to manage energy resources (Who do you trust most to manage energy production in Mexico?), Table 2 shows the main results. It can be seen that 36.07% of the total population belonging to Generation Z trusts the private sector to manage the energy sector. This means that 72.50% of the total population of Generation Z trusts the private sector. In addition, 27.5% of people belonging to Generation Z do not trust the private sector. On the other hand, Generation BB is the population group that trusts the private sector the least.

Generations	% Sample	% Population
Z, Centennials (1995–2009)	72.50	36.07
Y, Millennials (1980–1994)	14.00	6.97
X(1965–1979)	12.00	5.97
BB (1946–1964)	1.50	0.75

Table 3 shows the distribution of the population in terms of trust in the public sector, i.e. the government sector for the aspect of energy production. In particular, we can see a trend similar to that of Table 2, where of all the people who trust the government, 70.83% belong to Generation Z, 15.28% to Generation Y, 12.50% to Generation X and, finally, 1.39% to Generation BB.

> Table 3: Distribution of the Generations That Trust the Public Sector or Government the Most

Government the Wost			
Generations	% Sample	% Population	
Z, Centennials (1995–2009)	70.83	12.69	
Y, Millennials (1980–1994)	15.28	2.74	
X(1965–1979)	12.50	2.24	
BB (1946–1964)	1.39	0.25	

Finally, Table 4 shows the results of those who trust both sectors (public and private) to take care of the production of electrical energy. In particular, Table 4 shows the same trend in responses as Tables 2 and 3.

In the Same Way			
Generations	% Sample	% Population	
Z, Centennials (1995–2009)	73.08	23.63	
Y, Millennials (1980–1994)	18.46	5.97	
X(1965–1979)	7.69	2.49	
BB (1946–1964)	0.77	0.25	

Table 4: Distribution of Generations That Trust the Private and Public Sectors in the Same Way

In this way, research finding 1 can be established, which is that 5 out of 10 citizens of the municipality of Ensenada, Baja California, trust the private sector more to be responsible for generating electrical energy in Mexico. Research finding 2 is that 2 out of 10 citizens trust government agencies more for the same purpose. Research Finding 3 is that 3 out of 10 citizens say they trust more efficient cooperation between the private sector and government agencies to manage the energy sector.

Finally, an important aspect to highlight is that (research finding 4) the public opinion of citizens belonging to the Centennial Generation is extremely influential. On the other hand, the opinions of previous generations, such as the Millennials, Generation X, and Baby Boomers have less influence on public opinion. For example, 72.5% of those who said that they trust the private sector more to be responsible for the country's electricity production belong to the Centennial Generation.

#### **Designing Educational Structures on Sustainability**

#### Formal Structure

In general, formal education or formal learning has certain characteristics, such as 1) learning goals are set through linear progressions according to a pedagogical plan along with a formal study plan, 2) education has to be consciously planned, taking into account both the educator and the learner, 3) in terms of place, said the educational structure should take place in formal learning centers, where students' assistance can be required. 4) the knowledge gained is measured by numerical scores, 5) perhaps the most important feature is that the learning process doesn't have to be social, which means that students can choose to learn in solitude. In this way, once the formal education structure is established, and taking into account the results and discussions of this research work, face-to-face, and online learning activities have to promote sustainability and high social participation related to energy sector projects, such (see Figure 3):

- 1. Private companies in the energy sector could work with educational institutions to create accessible and affordable courses, certificates, and other activities for people related to sustainable development, energy projects, and social participation.
- 2. Private companies in the energy sector can independently create formal education programs, including social awareness and responsibility, involving citizens in energy and sustainability-related projects.

- 3. The public sector and all levels of government, in coordination with the private sector and educational institutions, can establish formal training programs.
- 4. The public sector, with all levels of government bodies, within the scheme of the various secretaries related to education, economic issues, innovation, environment, etc., can create formal educational programs.



Figure 3: Face-to-Face Education Programs Source: https://live.staticflickr.com/8118/15588661820\_d7f74ebb8a\_b.jpg (CC BY 2.0 DEED)

#### Informal Structure

In this type of teaching, the learning part is not as structured and is supported by indirect teaching activities. Learning as such doesn't necessarily have to be intentional, and the student may not even realize that he/she is learning. As for the learner's motivation, it may be intrinsic and not obvious to others. In addition, learning can take place at any time and in any place. In this kind of learning, knowledge isn't recognized or measured by numerical scores, but cognitive, emotional, social, and behavioral elements are the aspects considered. In summary, informal structured education is autonomous, experimental, flexible, and contextualized. In this way, having clarified the informal structured education and remembering the results and discussions of this research work, the following initiative is proposed to promote sustainability and high social participation concerning energy sector-related projects.

- 1. Forums, conversations, and online communities are designed to match the characteristics of X, Y, and BB Gens. These alternatives are unplanned. In general, public and private sector companies need to organize and collaborate to promote in a smarter way and with strategies this type of activities related to informal learning structure.
- 2. Websites, books, and other resources specifically designed for X, Y, and BB generations. In this sense, there is still much to be done in terms of asynchronous education via digital platforms.

#### Non-Formal Structure

This structure may be more complex to define as it has some features in common with both the informal and formal structures. All the characteristics mentioned above are optional in the non-formal structure, that is, they aren't mandatory. Learning has a voluntary dimension and is promoted through indirect teaching behavior. As in formal and non-formal learning, learning can be recognized or measured through qualifications. Therefore, non-formal and informal learning is more difficult to calculate clearly than formal learning. Concerning the latter, activities to promote sustainability and citizen participation in energy projects can be established in the non-formal structure, although these activities could be similar to those proposed for the informal structure.

#### **Conclusions, Limitations, Implications, and Future Tasks**

This research work approached the social perception and social approval regarding energy projects from the public and private sectors. The results of the surveys made it possible to identify different research findings related to the social perceptions of different generations. This will allow the definition of possible educational proposals to improve social acceptance regarding energy projects. All the above-mentioned proposals should be justified considering the Centennials, Millennials, X, and Baby Boomers generations. Therefore, prior market and anthropological research is necessary to guarantee the success of the educational programs.

However, it is important to mention some limitations regarding this research project and, more precisely, the results. First of all, there is a methodological limitation, which means that although the information on the population is provided by a government institution (INEGI), the application of the instrument doesn't take into account the generational distribution of the population. This may lead to a bias in the results towards certain types of generations, such as centenarians. Another limitation relates to geographical location. If this instrument were applied in other places in the state of Baja California, or in other states of Mexico, well, in other countries, it wouldn't be able to guarantee similar results, because it depends very much on the context and the history in which the energy projects are applied. In this particular case, the Municipality of Ensenada, where the project was tested, there is already an established relationship on energy projects between the public and private sectors, nationally and internationally.

In general, this research has important applications. In terms of educational applications, the research results and findings can be the starting point for designing educational programs, taking into account the different structures mentioned above. The previous theme and the results of the research also have potential social implications, since the information to the different generations can be taken into account to design educational programs, thanks to which it is possible that the positioning of the energy projects becomes stronger in terms of social respect. Along the same line, if the expectations of social and educational impacts are met, there can be important implications in the field of companies related to energy projects, i.e. the competitiveness between them will be strengthened. Finally, the results presented can be important for the public sector, as they can be a starting point for political implications with legal regulations before, during, and after the planning and execution of energy projects in specific locations.

Lastly, in terms of future research, it's important to note that, due to the limitations of the current research, the results do not seek to generalize in any context. Considering the latter, it's necessary to take measures to improve the methodology of applying the tool according to the socio-demographic contexts in each place. Nevertheless, the preliminary results of this research can be used as a starting point for other interdisciplinary indicators that may need the results.

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#### Kolb's Learning Styles of Centennial Stakeholders as Part of Transition Design Approach in the Social Laboratory Framework

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#### Abstract

Wicked problems are related by many interdependent factors making them seem impossible to solve. Some examples of wicked problems are education models, health care, income disparity, poverty, financial crises, and sustainability, among others. The analysis of wicked problems requires considering many aspects involved, in particular, the level and quality of stakeholder participation. If the stakeholders do not collaborate, it will not be possible to describe the wicked problem in depth, much less propose solutions. To explore the relationship with Centennial stakeholders, this research presents an exploratory, crosssectional, and quantitative analysis of learning styles according to Kolb's theory for Centennial stakeholders in a Transition Design approach. The results show that there are some predominant learning styles, e.g., Accommodation (LS1) related to feeling and doing, and Diverging (LS3) related to feeling and watching. Then, these learning styles are related to the various practices developed in the Transition Design approach. The conceptual and methodological contribution of the research is also presented, as well as the managerial and policy implications in the framework of a social laboratory. Finally, it is concluded that, according to our survey, Centennial stakeholders have a balance regarding learning styles that must be considered as part of the design of the approach to wicked problems.

Keywords: Community & Society, Education, Sustainability & Society, Social Justice, Development & Political Movements

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#### Introduction

Problem-solving has always been present in the history and development of humanity, going through different levels and stages due to the complexity of problems that evolve according to the reality of society. In particular, problems have reached wicked levels that seem impossible to solve due to the interdependence of variables that need to be considered when thinking about a concrete solution. Peters (2017) mentions that "the concept of wicked problems was developed in the planning literature to describe emerging policy problems that did not fit neatly into the conventional models of policy analysis used at the time". The latter was based on the work of Rittel and Webber (1973). Moreover, the formation of complex theories (social sciences) was led by the recognition of wicked problems in society at that time and served as a precursor to all the complex theories we know today. It could be said that wicked problems can't be molded into formulae or steps to be followed to find a way to their 'optimal' solution, that is, there is no good or bad solution to wicked problems. It's crucial to remark that not all problems are wicked, there is a big difference between a complex scaled problem and wicked level problems. Thus, contemporary problems are known for being classified as "wicked" because any logical or empirical approach tends to confront social and political actors and existing institutional regimes that must be respected (Termeer et al., 2019). Vermaas and Pesch (2020) identify six essential characteristics of the designer mindset needed to solve wicked problems:

- 1. Understanding problems beyond their description, having empathy with the people who live the problems, and looking for past answers and the reason for their failure.
- 2. Accept the need for a multidisciplinary team to ensure that problem definitions and responses consider a variety of approaches.
- 3. Promote the active participation of stakeholders, users, customers, or the sector of society in question.
- 4. Designers, like all participants, must add their perspectives by contributing their values, but as leaders of the project, they must decide on the specific interpretations or frames and possible directions of response.
- 5. The interpretations and directions chosen by the leaders must make the problems coevolve.
- 6. Throughout the process, experimentation and feedback must be encouraged.

#### **Transition Design**

According to Pujol and Valladolid (2011), the designer is an agent of change, producing interdisciplinary and transcultural communication models that allow the global market to collaborate with both industry and users, so it is appropriate to consider a methodology that responds to this dynamic. It is estimated that some methodologies (e.g., the projectual method, the systematic method, and design thinking, among others) do not consider in a mandatory way aspects of sustainable development of products, services, spaces, and systems as a part of solving complex social problems. In this way, the Transitional Design methodology considers the assessment of sustainability as a relevant factor in the selection of a potential solution to a problem. As a multidisciplinary methodology, it can be applied to many complex problems that require thinking from different sectors and disciplines, such as education, architecture, engineering, industrial design, politics, ecology, public health and safety, art, graphic design, urban planning, the food sector, digitalization, anthropology, communication, and ethic (Barbara & Scupelli, 2021). The transition design framework is shown in Figure 1.



Figure 1: Transition Design Framework

In particular, Irwin (2015) indicated that the transition methodology relates to a transition vision, theories of change, attitudes, and mindsets, and new design alternatives for products, services, and experiences, among other types of design.

#### Kolb's Learning Styles

According to Gooden and colleagues (2009), Kolb's Learning Styles (LS) inventory has two major hemispheres depending on how the individual being studied perceives and interprets information concerning to Experiential Learning (EL) Cycle. In particular, Abstract conceptualization (EL3) and concrete experience (EL1) are the ones responsible for describing how individuals perceive information, while reflective observation (EL2) and active experimentation (EL4) study processes or interpretations. The above is related to the type of learner, whether abstract (analytical and logical), concrete (examples), reflective (observing before judging), or active (extroverted to experience), all related to the four quadrants of Kolb's Learning Styles (see Figure 2).



Figure 2: Kolb's Learning Styles Inventory

The four types of Kolb learning styles are described below:

- Divergent (combination of concrete experience and reflective observation). Individuals with this learning style like to generate a wide range of ideas and gather information. They also have imaginative abilities encouraging creativity and viewing situations from multiple perspectives (Kolb 1981).
- Assimilators (Combination of Abstract Conceptualization and Reflective Observation). Assimilators can understand and formulate information logically and concisely. They focus more on abstract ideas and concepts and are therefore very good at creating models and defining problems. They are also very good planners (Kolb, 1981).
- Convergers (combination of abstract conceptualization and active experimentation). Thus, convergers learn by understanding concepts in an active form of learning and are very attentive to detail (Kolb, 1981).
- Accommodators (combination of concrete experience and active experimentation). Accommodators, like convergers, have elements of active experimentation, and this takes an active form of learning. Accommodators rely heavily on people for information in solving problems and like to take risks, so they will seek out new approaches to complete a project (Kolb, 1981).

On the other hand, Kolb's learning styles are usually used in a student-academic framework, but learning is not only an academic skill, but it is also used for everyday tasks and in a complex context, problem-solving. In general, it is quite common to associate visual learning with millennials, and thanks to today's technology, this generation is characterized by being a visual learner. Generation Z has a focus on respect and living in harmony with others, focusing on their own experience and reflection on what they've learned or want to learn, and applying it to their criteria in the decisions they make. At the same time, Centennials are known for their immediacy and avoidance of big processes. Centennials also tend to look for shortcuts to get things done quickly.

#### Social Laboratory

The social laboratory allows for the coexistence of different opinions in time and space, which, depending on the level of people's participation, allows for the creation of ideas and, subsequently, innovation in the social sector. These laboratories are democratic meeting places between citizens, academics, the business sector, and government representatives (El Colef, 2021).

In general terms, social laboratories can have different social impacts, some quantifiable and others not. For example, the processes of creativity and innovation in social laboratories can lead to the transfer of knowledge and technology to certain segments of the population, preferably vulnerable segments. Various inclusion and diversity initiatives can also be generated that address social problems simultaneously.

In addition, social labs can support the entrepreneurial spirit of citizens, which contributes to economic empowerment. Indirectly, social labs can help the supply chain of various companies, i.e. corporate issues related to suppliers can be addressed to strengthen regional economic vocations (Romero-Frías & Robinson-García, 2017).

Social laboratories can also serve the organization in which they are created, i.e. be internal laboratories of organizations, as is the case of the innovation laboratories of the United Nations International Children's Emergency Fund (UNICEF Innovation Lab), which is part of the Fund's Innovation Office and works with collaborative networks in more than 190 countries to iterate and generate scalable solutions that have a positive social impact for this and future generations (Innovation Office UNICEF, 2024).

#### Methodology

An instrument was developed to measure the learning intentions and styles of 351 people belonging to Generation Z (Centennials). The learning styles are based on Kolb's learning theory. The instrument used quantitative coding using the Likert scale to measure the statistics of responses to 12 statements, 4 statements for each Kolb learning style. In particular, the instrument was validated through internal and external mechanisms before its final application.

#### **Results and Analysis**

Specifically, the results show that Kolb's learning styles are predominant in the Centennial Generation, such as Diverging (LS3), which is related to feeling and observing. The least predominant Kolb learning style is Assimilating (LS4), which is related to thinking and observing. In the same context, the Kolb learning styles of Accommodating (LS1), related to feeling and doing, and Converging (LS2), related to thinking and doing, have a regular importance in the Centennial Generation. On the other hand, understanding that Generation Z (Centennials) covers a period of birth years, in this particular year, 2024, individuals from 14 to 30 years old would be classified as Centennials. In light of the above, statistics show that the Divergent Learning Style (LS3), which is associated with feeling and observing, is also a predominant learning style among Centennials between the ages of 14 and 30. However, it is also true that non-predominant learning styles change with age.

#### **Pedagogical Implications**

Given the above findings and the fact that Centennial Stakeholders are part of the transition design approach in the Social Laboratory framework, it is important to highlight some pedagogical implications and considerations to better address the description of the complex problem as well as the process of proposing potential solutions. In particular, the pedagogical implications refer to the strategies and tools used by the facilitators (teachers in the conventional context) to guide the sessions and facilitate the collective learning of the Centennial stakeholders (students in the conventional context) within the social laboratory framework. Therefore, some pedagogical implications are described below.

First, since LS3 is the predominant learning style, i.e., the learning preference of individuals is more related to feeling and observing, learning activities and objectives must be designed to prioritize this learning style. For example, you can start with a concrete experience (feeling), either through audiovisual material, case studies, testimonies of people, as well as fieldwork that allows people to be sensitized. During and after this concrete experience, it is necessary to do a reflective observation (watching). In particular, the reflective observation of the new experience (concrete experience) implies that Centennial stakeholders must reflect on the new experience based on their previous prejudices and knowledge. In particular, attention must be paid to the inconsistencies between the concrete experience and personal prejudices. This first pedagogical implication requires a detailed design by the working team that makes up the social laboratory, using the Transition Design methodology, as well as the correct selection and design of learning objects.

The second pedagogical implication is that while there is a dominant learning style, this does not mean that the other learning styles are not important. The reality is that a single learning style cannot define a Centennial stakeholder but rather is a mix of styles and learning preferences. Therefore, when implementing the Transition Design methodology within the Social Laboratory, the use of learning objects and activities that involve the rest of Kolb's learning styles must also be considered.

#### **Managerial and Policy Implications**

The above findings also have or should have, management and policy implications in the context of the Social Laboratory. Thus, it should be considered that the internal and external processes related to the activities of the social laboratory must be designed for the Centennial Stakeholders. This means that although there are other generations in society, such as baby boomers, millennials, etc., whose participation in the Social Laboratory is not limited, it is necessary to take administrative and political measures to take the Centennial Stakeholders into account to a greater extent. Otherwise, the participation of the Centennial Stakeholders could be affected in some way.

#### Conclusion

This research is concerned with the analysis of the learning styles and preferences of the Centennial stakeholders within the framework of Kolb's theory. This analysis is carried out as part of the design of a social laboratory that uses the Transition Design approach to analyze various complex problems and the path to their potential solution. In general, the results obtained provide an interesting starting point for the design of activities based on the learning styles of Centennial stakeholders. Considering the aforementioned, this research work has

certain limitations, the most important of which are the evolution of the perspectives of the learning styles of the Centennial stakeholders. On the other hand, this research work has certain limitations, the most important of which is the evolution of the perspectives of learning styles of the Centennial stakeholders. Still, even so, the results are a good starting point. Finally, the results of this research can be used by any educational and productive sector, both public and private, as long as the main market segment is the Centennials.

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#### ChatGPT-Generated Rhetoric: Developing Pedagogical Uses for L2 Instructors

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#### Abstract

The recent proliferation of generative AI tools has forced L2 educators to adapt their pedagogy at an unprecedented pace. While the debate on whether or not to utilize AI tools in curricula continues, an unexamined facet of these tools is how proficient they are with 'human-like' rhetorical writing skills. Therefore, this qualitative study is framed by the research question: Does ChatGPT exhibit the ability to use persuasive rhetoric in various genres of persuasive writing? By analyzing the unprompted rhetorical techniques generated by ChatGPT, this study seeks to proffer conclusions with potential pedagogical implications for rhetoric and L2 instructors in higher education. Specifically, the study aims to determine if ChatGPT can produce and appropriately use micro-rhetorical language techniques (e.g., tricolons, alliteration, or metaphors). To address this question, six written texts from different writing formats were generated and then analyzed using MAXQDA 2020 software: an academic essay, a job application letter, an editorial, an advertisement, a political campaign speech, and a love letter. Findings indicate that ChatGPT can replicate certain repetitive rhetorical language techniques in an appropriate manner. The more complex and personal rhetorical techniques were less evident. This study then provides pedagogical suggestions on how L2 instructors can use ChatGPT to help foster and develop better usage of deliberative rhetoric by learners of English. Given that AI tools will likely become integrated into the curricula of most educational institutions in the near future, understanding more about their capabilities to use rhetoric is extremely necessary.

Keywords: AI, Higher Education, L2, Rhetoric

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### Introduction

Artificial intelligence (AI) is a form of computer science that can replicate human intelligence. Long the source of science fiction movies and novels, AI became a reality in 1950 with the publication of Alan Turing's (1950) groundbreaking work, *Computer Machinery and Intelligence*. In it, he detailed a method of testing machine intelligence known as *The Imitation Game*. A steady increase in research and technological developments led to an "AI boom" in the 1980s (tableau.com, n.d.) and a subsequent watershed moment in 1997 when the IBM-developed program *Deep Blue* beat the human chess champion, Gary Kasparov. Since then, the emergence of smartphones and the proliferation of the Internet have sparked a surge in online platforms and apps.

One such prominent app, ChatGPT, was launched by OpenAI on November 30, 2022, and attracted more than one million users in its first five days (Marr, 2023). It is essentially an updated and advanced version of InstructGPT with a greater capacity to generate texts from a wider range of genres. The tool has since had an unprecedented impact on the field of education. By the summer of 2023, 32.4% of college students in Japan were using it (Masutani, 2023). Educators, institutions, and even government bodies have struggled to deal with its impact and to discern how it should be used. As Marr (2023) noted, ChatGPT's profound ability to understand and generate language has spurned a host of imitation tools. collectively known as Large Language Models (LLM). These tools can provide constant feedback, corrections and support for learners working on their written assignments (Barrot, 2023). For higher education institutions, ChatGPT has brought to the forefront discussions of academic integrity (Derakhshan & Ghiasvand, 2024). What constitutes student work and what constitutes plagiarism remains unsettled and has been the focus of great discussion, leading to resignation among many teachers, with the belief that "even if we could ban it, we shouldn't" (Warschauer et al., 2023, p. 5). As such, the 'human-in-the-loop' approach (Ranade & Eyman, 2024), whereby learners are encouraged to take ownership of using and working with AI instead of just relying on it, has taken hold.

Despite its relatively recent appearance, quite a substantial body of research already exists on various perspectives of ChatGPT and how it can be integrated with language teaching. Significant linguistic differences have been found between human-written and ChatGPT-generated essays, which are easily identifiable (Mizumoto et al., 2024; Berber Sardinha, 2024). Others have found the opposite to be true and that reviewers could not distinguish between AI- and human-generated texts (Casal & Kesler, 2023), nor could teachers (Fleckenstein et al., 2024). Ironically, the solution to detecting AI-generated texts might lie in technological systems. Berriche and Larabi-Marie-Sainte (2024) have developed a technique that proved 100% accurate in distinguishing between the two by analyzing lexical, grammatical, and structural features.

In Japan, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has urged a proactive approach to utilizing ChatGPT in English language classrooms and has stressed the importance for instructors to develop AI literacy (Sakai, n.d.). However, without decisive policies and guidelines to clearly specify approaches to dealing with the use of ChatGPT, instructors are left to make ad-hoc rules in the classroom. Still, there have already been explorative studies on how teachers can utilize such platforms for language learning. Sakai (2023) pointed out that while ChatGTP (and other platforms) offer learners many opportunities to enhance their language skills, they still need critical discernment when putting together their ideas. Schmidt-Fajlik (2023) compared the effectiveness of ChatGPT as a grammar checker with two other platforms (Grammarly and ProWritingAid) and found it to be superior. Hayashi and Sato (2023) also showed that ChatGPT helps to reduce second language anxiety among learners. In terms of speaking, Wang, Iwata, and Okamoto (2024) demonstrated that ChatGPT could be used to foster improvements in students' presentation skills.

While there has been great interest in exploring the linguistic capabilities of ChatGPT in second-language learning contexts, there has been no research to date related to the use of rhetoric by AI-generated platforms. Rhetoric is likely one of the oldest academic disciplines and can be loosely defined as the use of language for persuasive purposes (Toye, 2013). Deliberative rhetoric, as explained by Aristotle, is the use of rhetoric to persuade audiences (and readers) (Lucas, 2015), as opposed to other forms of rhetoric, which are mainly used for structuring and organizing written texts.

# Methodology

With ChatGPT developing at a rapid pace, it is important to explore whether it can implement advanced human writing techniques, such as the use of rhetorical techniques for persuasive purposes. If it can replicate human persuasiveness, this will have a significant impact on all aspects of our lives. This study is framed by the following research question: Does ChatGPT exhibit the ability to use rhetoric in various genres of persuasive writing? The purpose is to learn if or how ChatGPT employs rhetoric and then incorporate these findings into suggestions for second language (L2) learning pedagogy.

To address the research question, a qualitative approach was adopted, with an abridged form of the University of Kentucky's glossary of rhetorical terms (n.d.) serving as the framework for analysis. Slight modifications and additions were made to this model based on work by Rowland (2019), Fairhurst (2011), and Gough (2018) and the list is by no means an exhaustive list of such terms. Table 1 provides a list of the rhetorical techniques coded in this study.

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Rhetorical technique	Definition
Alliteration	repetition of the same sound beginning several words in sequence
Allusion	an indirect reference to existing history, rhetoric, or norms
Anaphora	repetition of a word or phrase at the beginning of successive
	phrases, clauses, or lines
Antithesis	opposition or contrast of ideas or words in a balanced or parallel
	construction
Asyndeton	lack of conjunctions between coordinate phrases, clauses, or
	words
Doubling	use of language in a pattern of two
Euphemism	use of a less offensive expression for a harsher meaning
Hyperbole	exaggeration for emphasis
Irony	expression of something which is contrary to the intended
	meaning
Knock-down	building up opposing points to then refute
Metaphor	implied comparison achieved through a figurative use of words
Oxymoron	the juxtaposition of words which contradict common sense
Paradox	an assertion that goes against common sense

Table 1: Rhetorical Techniques

Personification	attribution of personality to an impersonal thing
Rhetorical question	a question that does not need to be answered
Simile	an explicit comparison between two things
Tricolon	the use of words, phrases, or clauses, in a pattern of three

The data were collected from the ChatGPT-3.5 model (free version) in the form of six different genres of writing to provide a wider scope of inquiry. No rhetorical prompts were given as the study seeks to analyze naturally occurring rhetoric in the texts. Table 2 provides a list of the six genres, the prompt given to generate the written text, and a word count.

	Table 2: Written Texts Analyzed
Form of writing	Prompt
Academic essay	Write an academic essay on the benefits of using ChatGPT in
	student essays. (455 words)
Job application letter	Write a job application letter. (291 words)
Editorial	Write an editorial on the crucial importance of voting in an
	election. (553 words)
Advertisement	Write an advertisement about why to choose craft beer. (197
	words)
Political speech	Write a speech to persuade voters to support a candidate. (407
	words)
Love letter	Write a love letter to my wife. (293 words)

Once collected, the data were analyzed to determine if ChatGPT can utilize rhetorical techniques. The texts were coded through the use of MAXQDA software (2020 version) using the framework for analysis outlined in Table 1.

#### **Findings**

The findings from this study reveal that ChatGPT can utilize certain rhetorical techniques. However, there are certain techniques which it employs frequently and others that it appears unable to utilize (without being prompted to do so). Three key findings can be garnered from the analysis of the data.

Firstly, rhetorical techniques were apparent in all genres of the ChatGPT texts analyzed in this study. Table 3 provides a quick overview of the frequency counts.

	Tabl	e 3: Frequency	Counts for I	Rhetorical Technic	ques	
Technique	Essay	J.A. Letter	Editorial	Advertisement	Speech	L. Letter
Alliteration	2	0	1	2	0	0
Allusion	0	0	1	0	0	0
Anaphora	0	0	0	0	6	1
Antithesis	1	0	1	1	1	0
Asyndeton	0	0	0	0	0	1
Doubling	21	7	14	6	4	6
Euphemism	0	0	0	0	0	0
Hyperbole	0	0	0	1	0	5
Irony	0	0	0	0	0	0
Knock-down	2	0	0	0	2	0
Metaphor	4	0	3	6	2	5
Oxymoron	0	0	0	0	0	0

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Paradox	0	1	0	0	1	0
Personification	0	0	0	1	0	0
Rhetorical Q.	0	0	0	1	0	0
Simile	0	0	0	0	0	0
Tricolon	3	3	6	1	9	8
Totals	33	11	26	19	25	26

The texts varied in length, so direct comparisons cannot be made, but the overall totals indicate the prevalence of rhetoric in all six forms of writing. The word counts for the Job Application Letter, and the Advertisement were fewer than for the other four texts, so it is not surprising that the overall frequency of rhetorical techniques coded in both is also lower. The Love Letter was also relatively shorter in length but had a higher frequency of rhetorical techniques. Given that essays typically exhibit a higher frequency of rhetorical techniques (structural and persuasive), it is not surprising to find it featured more than the other forms of written text.

In terms of specific techniques, the findings reveal that repetitive language techniques such as doubling and tricolons were the most frequently employed. Two examples of doubling can be found in one sentence from the essay: "... concerns about authenticity or over-reliance on technology, the benefits of integrating ChatGPT into student essays are numerous and substantial." (AEL4-5). This example also serves as an antithesis as the two negative concerns are contrasted against the two positive descriptions. An example of a tricolon is drawn from the job application letter: "I facilitated classroom discussions, provided individualized support to students, and collaborated with colleagues" (JALL12-13). The list of three positive attributes and experiences possessed by the applicant are displayed here to reinforce the idea that they are qualified for the position of being a teacher. Doubling and tricolons are simple to construct and serve an emphatic purpose, so they tend to be employed in deliberative rhetorical situations, such as these written genres. As they are shorter than some of the other more elongated techniques, it is also easier to use them more liberally in a text without aggravating the reader.

Complicated rhetorical techniques such as oxymoron, simile, irony, and euphemism were not used at all. This is not surprising as using such techniques depends on an understanding of language that goes beyond the lexical and semantic levels. Cultural and historical knowledge determines the use of such techniques, which is also likely why only one example of an allusion was found across the six texts, a quote by US President Franklin D. Roosevelt: "Nobody will ever deprive the American people of the right to vote except the American people themselves—and the only way they could do this is by not voting." (EL48-50) which ended the editorial. Although the prompt did not specify any particular cultural references to be made, ChatGPT employed a reference to US politics, even though the author is not American, and the tool was accessed outside the US. Similarly, hyperbole was also only used once across the texts and was employed at the beginning of the advertisement: "Unleash your taste buds with our exquisite range of craft beers, meticulously brewed for the discerning palate." (AL1-2). Finally, an asyndeton was also only coded once, as it likely registers as 'ungrammatical' for generative AI tools. The occurrence was found in the love letter: "My wife; you are my best friend, my confidant, my soulmate." (LLL5).

In terms of unexpected findings, metaphors were used (the third most frequently used technique) across five of the six written genres. The more poetic use of language is traditionally not attributed to AI-generative tools, but ChatGPT proved adept at employing

them. Perhaps, not surprisingly, the love letter features a series of rather overly dramatic metaphors, such as: "...my anchor through life's storms and my beacon of hope in times of darkness. Your laughter is music to my ears, and your smile lights up my soul." (LLL8-9).

The other unexpected finding is that a rhetorical question is featured only once in the texts, contradicting findings in most rhetorical studies, where it is one of the more predominant techniques employed. The following simple question was posed in the advertisement: "Why choose craft beer?" (AL4). This could be indicative of a lack of interpersonal skills on the part of ChatGPT, whereby it is unable to identify the need to establish a connection with the audience (reader) it is communicating with (the typical purpose for employing rhetorical techniques). The same rationale applies to the absence of anecdotes that were not coded in this study, but which were notably absent from the generated texts.

Ultimately, the answer to the research question in this study is that ChatGPT-3.5 can utilize certain rhetorical techniques that mirror the use by human writers. Nevertheless, such usage is largely restricted to simplistic and emphatic techniques. Techniques that promote interaction with the reader and that portray cultural and historical contexts by the writer under the assumption that they will be comprehended by the reader were rarely found in this study. This finding must be prefaced by the understanding that only the free version of ChatGPT was used in this study and that newer and more advanced versions are being released, which are more likely to be able to use rhetorical techniques as humans do. It should also be noted that the texts generated in this study did not contain any prompts to produce rhetorical techniques, as the intention was to examine if such techniques were employed naturally. The use of such prompts would have undoubtedly produced very different findings.

### Discussion

ChatGPT-3.5 (the free version) exhibits structural and repetitive rhetorical language techniques but fewer content-related ones in a pattern that stresses emphasis over evidence or cultural references. The texts also have what some instructors like to label 'a mechanical feel' about them. There is little attempt to interact with the reader through anecdotes, rhetorical questions, or personalizing. Despite these weaknesses, ChatGPT can be used for pedagogical purposes. In this discussion, it will be assumed that instructors (and learners) only have access to the more limited free version of the platform due to financial restraints. In general, there are four potential pedagogical implications and practical uses for instructors who are teaching L2 courses in higher education or those engaged in specific rhetoric-based courses.

Firstly, through ChatGPT, rhetorical texts can be quickly mass-produced for use in classrooms. The six texts analyzed in this study were generated in mere seconds after the prompts were made. A lack of readily available resources is a problem for many instructors. Textbooks rarely fully meet the needs of courses, and instructors are frequently required to produce their own supplemental materials in time-consuming work. For a subject such as rhetoric, materials typically focus on historical discussions from Ancient Greece or deal with political examples. Both can seem abstract and unrelated to the real-world usage of today's university students. Topics and modern forms of written texts (e.g., blogs or online posts) that are suitable for learners can be instantly created and still incorporate classic rhetorical techniques.

Secondly, these texts can be crafted with prompts or left in their simple form, depending on the prompts given. While the texts in this study were generated without prompts to include

rhetorical techniques, they still featured a wide range of them. It can be assumed that with more specific prompts, texts with prompts to include certain techniques can instantly be generated. Such materials can be used to promote noticing and learners can identify, not just the usage of specific rhetorical techniques, but the context they are used in, and how certain techniques are intertwined to make a stronger persuasive message.

Thirdly, textbooks (focusing on specific forms of language) often showcase examples of how to implement certain language features but seldom provide language texts which are devoid of the target feature. This is another effective way of learning (by noticing what is not included and discussing how it could be added to enhance the emphatic message intended). The more complex techniques analyzed in this study (e.g., allusion, irony, or oxymoron) were notably absent from the texts and could be the focus of a lesson. Discussions on how to craft these techniques and where to add them to the existing texts would be a productive endeavor.

Finally, a discussion on rhetoric can be conducted to cover the appropriacy of certain techniques. Blatantly inappropriate texts could be generated but would likely be counterproductive. Instead, examples of texts could be generated featuring certain techniques which may be appropriate in certain cultural contexts but less so in others. An example of this could be the use of hyperbole (not apparent in the texts analyzed in this study) in job application letters. While in certain cultures it is necessary to promote yourself explicitly when applying for a job position, in others it is counterproductive to do so.

The ultimate takeaway from this study is that it is possible to use technology to create more learner awareness regarding what rhetoric is and how it can be used effectively. ChatGPT offers instructors an array of options for materials development. Such materials can help facilitate learners' better understanding of how to use rhetoric more appropriately and more effectively.

# Conclusion

From this study, it can be ascertained that generative AI platforms like ChatGPT can already employ the use of certain rhetorical language techniques across a broad range of written forms. While they cannot yet completely emulate human use of rhetoric, it is likely only a matter of time before they can. Instead of shunning such technological progress, instructors should embrace the new opportunities these generative AI platforms provide. Assistance with materials development would appear to be one possibility that is certainly worth exploring, especially for subjects such as rhetoric.

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#### Priming University Students for the Reality of Teaching English in Japan

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> The Barcelona Conference on Education 2024 Official Conference Proceedings

#### Abstract

This short paper delineates a support framework for pre-service English teachers which is being developed for students at a private Japanese university and identifies the main challenges which Japanese pre-service English teachers face. The authors provide an overview of the support which was given before and after a cohort of pre-service English teachers (n=7) started their English teaching practicums. Three mini-workshops were designed to support these students. The workshop titles were: (1) a sample class and microteaching; (2) finding solutions to pedagogical problems; and (3) post-teaching practice reflection. The content of these mini-workshops is outlined along with how the research team is planning to enhance its support system for Japanese pre-service English teachers.

Keywords: Pre-service Teachers, Support Structure, Workshops

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#### Introduction

Despite the training they receive at university, many pre-service English teachers in Japan are unprepared for the realities in the classroom when they launch their teaching careers. Teaching is a craft that takes years to master and the more support that pre-service and novice teachers receive in their formative training and teaching years the better the pedagogical outcomes will be. This paper highlights a Japan Society for the Promotion of Science (JSPS) Kaken-funded research project (No. 23K20483) which aims to ascertain the needs of preservice English teachers in Japan and support their pre-service teacher training. Initially, the paper provides a brief background on teacher training for English teachers in Japan before outlining the support structure which is currently being put in place as part of this research project. The focus of this paper is on the strategies the researchers utilized to help prepare a cohort of seminar students (n=7) at a private Japanese university for their teaching practicums. The authors describe how support was offered through three mini-workshops before and after their onsite teaching practice at Japanese junior and senior high schools. The content of these mini-workshops is outlined along with suggestions regarding how the support system for Japanese pre-service English teachers can be enhanced.

#### Background

The support structure for pre-service English teachers in Japan is less than ideal. Insufficient teacher training has created a divide between educational policies in Japan and the realities of the teaching profession (Kikuchi & Browne, 2009). Thus, it is imperative that Japanese preservice English teachers receive adequate training (Kurosawa, 2011; Ueno, 2013). Preparatory training for pre-service teachers at Japanese universities typically emphasizes pedagogical theory, the historical context of English education in Japan, and legal considerations, yet allocating only a limited timeframe to hands-on practical training. Consequently, the practical training component integrated into the teaching license course, especially the onsite teaching experience at junior and senior high schools which provides a short teaching programmes can provide one solution to this glaring shortcoming (Fukushima, 2018; Steele & Zhang, 2016; Tahira, 2012).

The research project outlined in this paper aims to support pre-service English teachers in Japan by building on past research involving teacher-training workshops and online resources for in-service educators. The foundation of the project lies in previous JSPS Kaken-funded initiatives (No. 15H03481, No. 20520538, and No. 23520722), which developed pedagogical workshops and online support frameworks for junior and senior high school English teachers. These successful models now provide a basis for identifying and addressing the specific needs of pre-service English teachers. The research team (i.e., Dr. Cripps, Dr, Imai, and Dr. Toland) is working to extend these efforts to help future educators. The research project focuses on two primary research questions: (1) What are the pedagogical needs of pre-service English teachers in Japan?; (2) What type of support structure is needed to help these teachers? The project is guided by action research as the methodological approach endeavours to find practical solutions to educational challenges (McNiff, 2013). It aims to addresses the issue of supporting pre-service English teachers as they strive to meet the requirements outlined in the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) Course of Study (CoS) guidelines, which emphasize creating globallyminded citizens proficient in English (Tahira, 2012).

Traditional teacher-training methods in Japan are often outdated, leaving a gap between what is currently offered and what is required under the latest CoS guidelines. This research project aims to fill this gap by creating an innovative support framework specifically tailored to pre-service English teachers' needs, helping them acquire the skills necessary for teaching English in an ever-changing environment. As part of this research project, the research team has been designing and holding a series of workshops for pre-service English teachers over the last three years. The workshops are briefly described below.

### **One-Day Workshops**

As part of a JSPS Kaken-funded research project, a series of workshops has been held since 2022. Two one-day workshops were held in June 2022 and November 2022. The content of each of these workshops was based on questionnaires and written and oral feedback from pre-service English teachers. Before the first workshop, pre-service teachers (n=20) were asked through an online questionnaire, what topics they would like to be included in teacher-training workshops designed to address their specific needs. For the first workshop the topics of 'How to use information and communications technologies (ICT)' and 'creativity and critical thinking' were the most popular suggestions, and these were used as the foundation for its construction. For subsequent workshops, oral and written feedback provided by the workshop participants were woven into the design of future workshops. The overarching theme of the second workshop was 'Improving students' English-speaking skills' (for more details about the first two workshops see Cripps et al., 2023a, 2023b). Each of these workshops sought to furnish the participants with theoretical and practical knowledge related to teaching English at junior and senior high schools in Japan.

		Table 1: Content of the 2022 Workshops
No.	Date	Content
1	June 25,	Creativity and ICT use
	2022	Prof. Toland – The International University of Kagoshima, Japan
		Critical thinking and writing
		Prof. Uchida – Akita International University, Japan
2	November	Helping false beginners to read and write
	19, 2022	Prof. Uchida – Akita International University, Japan
		Strategies to support Japanese English language learners' 21 <sup>st</sup> century skills
		Prof. Toland – The International University of Kagoshima, Japan
		How to reverse the trend: Japanese could speak English better
		Prof. Matsumoto – Bond University, Australia
		Tips for getting your students to speak English
		Prof. Tony Cripps – Nanzan University, Japan

#### Mini-Workshops

After the two one-day workshops which were held in 2022, the lead researcher, Dr. Cripps, decided to hold three mini-workshops in May and June 2023 to support his seminar students who were to undertake their practical teacher training as part of their teaching license course. The participants (n=7) of these mini-workshops (duration=100 minutes) were Dr. Cripps' fourth-year seminar students who were taking the teaching license course. Table 2 shows the content of the three mini-workshops.

	Tab	ble 2: Content of the Three Mini-Workshops
No.	Date	Content
1	May 17,	Sample class and micro-teaching
	2023	Prof. Tony Cripps – Nanzan University, Japan
2	May 24, 2023	<b>Q &amp; A – Finding solutions to pedagogical problems</b> Prof. Tony Cripps – Nanzan University, Japan
3	June 21, 2023	<b>Post-teaching practice reflection (online)</b> Prof. Tony Cripps – Nanzan University, Japan

# Mini-Workshop 1 – Sample Class and Micro-Teaching

The first mini-workshop focused on providing Dr. Cripps' seminar students with a sample class and samples of 'micro-teaching'. Dr. Cripps gave a sample English class for upperintermediate level students. His seminar students were shown the following: (a) how to begin a class, (b) how to get students interested in the topic at hand, (c) how to introduce key vocabulary, (d) how to conduct pair work activities, and (e) how to introduce students to reading and comprehension strategies. The workshop was video recorded and used later in the creation of teacher-training videos.

# Mini-Workshop 2 – Finding Solutions to Pedagogical Problems

For the second mini-workshop Dr. Cripps' seminar students spent the first 50 minutes asking him questions about how to teach junior and senior high school students. The students' desks were arranged in a semi-circle facing Dr. Cripps. After 50 minutes the situation was reversed, and each student had a chance to sit at the head of the class and answer questions. A list of 25 questions had been prepared by Dr. Cripps pertaining to teaching English and teaching in general. The questions provided representative examples of situations that the students may face during their teaching practice. Examples of these questions are as follows:

- 1. How will you begin your first class?
- 2. What is your 'English policy'?
- 3. How would you try and improve your students' listening skills?
- 4. How will you introduce students to new vocabulary?
- 5. What would you do if one of your students falls asleep in your class?

# Mini-Workshop 3 – Post-teaching Practice Reflection

The third mini-workshop took place on Zoom, a video conferencing platform, on June 21, 2023. The students who had completed their teaching practice at their respective junior and

senior high schools were encouraged to talk about their teaching practice experiences. Initially, they spoke in English for 20 minutes but then they were encouraged to switch to Japanese and spoke for a further 80 minutes. The discussion of their teaching practice was candid, animated, and extremely interesting. The students found the whole 'debriefing' process extremely cathartic. In addition to the oral feedback provided by the post-teaching practice reflection on Zoom, the students also completed an online questionnaire which asked them to reflect on their teaching experiences and teacher training as a whole (this is the subject of a forthcoming paper – Cripps et al., 2025b).

# **Future Support**

The research team is planning further support for pre-service English teachers in Japan as part of this research project. Additional support which is currently being considered is as follows:

- 1. Establishing an exchange project (both online and face to face) with pre-service English teachers who are studying at a university in Okinawa.
- 2. Conducting interviews with novice in-service teachers to ascertain their support needs.
- 3. Creating a community of practice group (utilizing the LINE app) for novice in-service teachers. This support group will act as an idea-sharing forum.
- 4. Involving more ex-seminar students who are now in-service teachers in future workshops (see Cripps, Imai, & Toland, 2025a).
- 5. Compiling a bilingual list of 'classroom English phrases' for students and teachers.

# Conclusion

Priming pre-service English teachers for the challenges that they will face in the classroom and arming them with the practical skills that they need should be at the core of any teachertraining programme. Arguably, the main weakness in many teacher-training courses run by Japanese universities is the lack of focus on the provision of practical skills. Too much emphasis is placed on the teaching of laws, regulations, and history. A fundamental shift in how teacher training is conducted in Japan is needed if MEXT wants to improve the standard of teaching, increase teacher job satisfaction, and reduce the attrition rate of teachers. The support framework outlined in this paper aims to go some way towards helping prepare preservice English teachers in Japan for the professional challenges they will face in the future.

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# Students' Reliance on AI-Based Tools in Written Expression Course: Challenges and Solutions

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#### Abstract

In recent years, AI-based tools have changed our world massively; these tools opened up new possibilities in all sectors, and education is no exception. However, students' reliance on these tools such as ChatGPT has a negative implication. This paper examines the impact of AIbased tools on studying written expression course among first and second year students at the university of Mohamed Ben Ahmed Oran2, Oran, Algeria. The study also explores the challenges the teachers of written expression course face. Written expression course teaches students the essentials of written compositions. This research employed the mixed method approach to better answer the research questions. Both semi-structured interviews and a questionnaire were used to collect the data. Both teachers and students were under investigation. The interviews were conducted with three written expression course teachers; on the other hand, the questionnaire was addressed to 20 first and second year students. The paper delves into the causes of such excessive reliance as the lack of confidence, the quick easy access to these tools, the availability of information, lack of awareness. It also highlights the consequences of such increasing reliance such as the passive learning experience which will obstruct the development of critical thinking, diminish active engagement, and the cognitive processes that the students may go through in order to write good readable texts. This paper also proposes strategies to alleviate its negative impact, such as spreading awareness.

Keywords: AI-Based Tools, Written Expression, Oran 2 University Students, Teachers, Challenges, Solutions

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#### 1. Introduction

AI-based tools or machines are highly sophisticated software that generate human-like conversations. The early 2020s witnessed the rise of AI-based tools in the academic context. These high-tech tools became an integral part of the students' life. This technology has changed the studying-learning game. Offering fast and efficient assistant, these machines became indispensable. AI-systems aid students to answer questions, explain complex concepts, or write essays in a click of a button. Quick accessibility to the vast body of knowledge led to the growing dependence on the AI- dialogue systems. Moreover, the personalization of the answers made these tools more appealing. Students world wild have access to devices like smart phones, computers etc... making AI-powered machines available regardless the time and place. The ability to get prompt responses is an appealing phenomenal experience for students. However, the world wide community has rung the warning bell after the rising concerns about the potential negative impact of its use on education, especially the writing tasks.

At Oran2 Mohamed Ben Ahmed University, first and second year English language bachelor students are offered written expression course. Written expression course teaches students the essentials of written compositions i.e, how to write paragraphs and essays in English language. Students are often asked to write paragraphs and essays covering different topics. However, when students depend on IA-based dialogue systems to assist in writing their paragraphs and essays ignoring the engagement in the learning process, the outcomes are disastrous. According to Kaeppel (2021), it is pivotal for students to develop their cognitive abilities, especially those students involved in tasks like synthesizing, evaluating, and forming arguments. The over-reliance on the AI-based tools will eventually lead to deactivating the students' cognitive abilities responsible for such tasks; as a result, the development of the cognitive abilities will cease leading to other problems "cognitive abilities of a person are innate, but it is important to pay significant attention to their development from the very birth of the baby and throughout life."(Akhmetova et al., 2024, p. 1). Lepp, Barkley, and Karpinsky (2015) ensure that the over-use of smartphones and social media engagement reduce attention span and decrease memory performance. The lack of academic honesty, ceasing cognitive development, and the lack of deeper learning are all reasons that urge teachers to step and strike the balance between allowing the students to use these tool rationally in a way that does not hinder the cognitive development and ensure the progression of the learning-teaching process. Therefore, this piece of research aims to:

- Examine the impact of AI-based tools on studying written expression course among first and second year students at the university of Oran2 Mohamed Ben Ahmed, Oran, Algeria.
- Explore the challenges the teachers of written expression course face.
- Uncover the causes leading to the students' over-reliance on AI-engines when doing their writing assignments.
- Suggest solutions to this issue.

This paper aims to answer the following questions:

- What is the impact of AI-based tools on studying the written expression course among first and second-year students at the University of Mohamed Ben Ahmed Oran 2, Oran, Algeria?
- What challenges do the teachers of written expression course face?
- What are the causes leading to students' over-reliance on AI-engines when completing their writing assignments?

• What solutions do written expression teachers propose to address students' overreliance on AI-based tools in their writing tasks?

Several research papers tackled the over- reliance on AI-based tools from educational, pedagogical, and psychological perspectives. Stohr, Wanyu Ou, and Malmstrom (2024) concluded that although students find AI-Chat bots useful in assisting them to do various tasks such as writing, coding, and offering immediate responses etc..., the concerns remain high, as they worry about the over-reliance on these tools on their critical thinking progression, problem solving, and creativity. Zhai, Wibowo and D. Li (2024) studied the impact of AI-systems on students' learning attitude and cognitive development. They found that addictive reliance on these tools can diminish cognitive abilities, decisions making, and analytical skills. Bognár et al. (2024) examined the extent to which AI-language models can impact students' engagement. The researchers demonstrated that although these tools can enhance personalized learning and feedback, the over-reliance can diminish critical thinking, decrease academic input and creativity. Abbas, Jam, and Khan (2024) navigated through the consequences of using AI-tools among university students. The researchers found that the over-reliance can lead to reducing cognitive engagement's rates, resulting in a negative learning behavior like laziness and plagiarism.

As demonstrated above, all the presented pieces of research focus on AI-engines over reliance in educational settings and among university students in general; however, the present study goes deep, focusing only on one course, namely, written expression, one specific environment, namely, language learning, two specific levels, first and second year bachelor students, and on one geographical setting, Oran, Algeria. This study will start a new trend of research in this field, focusing on the impact of the issue under study on specific programs or courses, dissecting the problem and trying to find solutions to it. Furthermore, the current inquiry is new trend within this somehow novice field of research, attempting to fill a gap in the knowledge body.

# 2. Methodology

This research employed the mixed method approach to better answer the research questions. Both semi-structured interviews and a questionnaire were used to collect the data. Both teachers and students were under investigation. The interviews were conducted with three written expression course teachers; on the other hand, the questionnaire was addressed to 20 first and second year students. The interview and the questionnaire were designed by the researcher. The students were assisted and accompanied by the researcher during questionnaire answering. The data collection procedure took one month to be terminated. All the collected data was analyzed manually; no software were used. The interviews span ranged from 15 to 20 minutes. The researcher herself was among the interviewed researchers. The researcher resorted to a research assistant to conduct the interview with her. The questionnaires were carefully explained to the students to ensure good quality data collection.

# 2.1 The Participants

3 written expression university teachers were under study. They all have been teaching written expression from 2 to 7 years. All the teachers hold PhD in English language. Regarding the students, their ages range from 17 to 21 years old. 10 are first year students, and the other 10 are second year students. The students were purposefully selected based on their performance. The researcher observed the students' performance during regular sessions

and exams. When they are asked to write paragraphs about different topics in the classroom or at home, when time session is over, the researcher noticed that there is a huge difference between their paragraphs written in the classroom during regular sessions or exams and at home. After investigation, the researcher found that when the students are outside the classroom, they use AI- based tools like ChatGPT to generate the paragraphs for them. This issue irritated the teacher and urges her to conduct a study tackling this problem and trying to understand this phenomenon and to find solutions to it.

#### 3. Results and Discussion

In this section, the findings of the study are presented, analyzed, and discussed in detail. This section is divided into two sections. The first uncovers and analyzes the findings of the students' questionnaire while the second uncovers and analyzes the findings of the teachers semi-structured interviews.

# 3.1 The Analysis of the Students' Questionnaire

The students under study were carefully chosen after observing their performance, compering it, and contending that they use AI-based tools. Therefore, all the selected students use AIbased tools to assist them when writing their writing assignments. When the students were asked if they feel that these AI-means help them to improve the quality of their written works, all of them said "yes". All the students agree that AI-tools are very useful and helpful when generating ideas and sentences. When they struggle to generate due to the lack of language competence, specifically, language production difficulty, they resort to AI chat models for an instant solution to the problem, especially, since English language is learned in these classes as a second language; Silva (1993) concluded that second-language writers often struggle with planning, setting goals, and organizing their ideas, resulting in more surface-level revisions, less frequent reviewing, and limited fluency in their writing. One of the students revealed that these platforms help him to detect and correct his grammar and spelling mistakes automatically in a click of a button. He added that thanks to ChatGPT he doesn't need to spend time and mental efforts searching for these errors and correcting them manually. The real time feedback is another feature they like about AI- conversing engines. Another student spoke about being offered style improvements and proofread her work in real time. It seems that all these features tend to attract the generation Z (gen Z) students. According to Forbes (2024),

"Generation-Z has grown up in an era where technology is inevitable. With smartphones in hand from a young age, Gen-Zers have an intuitive understanding of digital platforms and are at the forefront of adopting new technologies like augmented reality, blockchain and artificial intelligence."

It has been found that features like: grammar and spelling checks, style and clarity suggestions, real-time feedback, and error detection and correction etc., make AI-conversation models appealing to the students, and encourage them to extensively use these tools whenever they have a writing assignment.

17 out of the 20 students under study think that the over-reliance on AI-based tools may affect their ability to improve their writing skills independently. One of the second year students entails that students must be careful when using these platforms and have self control; otherwise, students will have some serious problems that they must deal with later. One of the first year students said "to be honest, ChatGPT does the work for me". Another one said "yes, off course, when you over-rely on ChatGPT, you will not be able to use your brain and practice writing; as a result, you will not be able to improve your writing skills". One of the second year students thinks that AI tools are dangerous, and they meant to replace and transform humans into unproductive and lazy creatures. According to Binns (2018), overrelying on AI tools can decrease critical thinking, problem solving ability, and increase human being passivity". Based on students' responses, it seems that the students are to some extent aware of the fact that relying on AI-based tools will deprive them from reaching their full cognitive potentials when writing in addition to depriving them from going through the usual writing process: prewriting, drafting, revising, editing, and publishing. This justifies why their performance is weak during exams.

When the students were asked how confident they are in their writing skills without the use of AI-based tools, the answers range from neutral to not very confident. 13 students out of 20 chose neutral while the other 7 said that they don't feel that confident. Their answers justifies their complete extensive reliance on AI-tools when writing, ignoring the outcomes of their deed. It has been noticed that they feel insecure when it comes to writing due to many reasons such as the lack of grammar, spelling, lexicon competencies. They believe that the machine can do it better, creating a feeling of anxiety, doubt and insecurity. Lack of self-efficacy is another reason leading to the extensive use of AI in writing. Here, students develop some sort of a negative perception about themselves, believing that without AI-engines they can not achieve success. Negative feedback is one of the reasons. Students fear hearing the teachers' negative feedback because of the lack of confidence. They think that if their written compositions are not AI supported, their works will not meet the requirements. Consequently, the psychological barriers play a pivotal role in pushing the students to depend on AI. The students run from the reality and do not accept the fact that they have some writing issues, so instead of working on these issues and improving their writing skills, they resort to AI for a quick solution, hiding beneath AI. Therefore, the problem seems deeper that it appears.

Then, the students were asked if AI-based tools help them understand and learn from their mistakes. Here, their answers vary. 4 students out of the 20 said "yes, sometimes". The students who selected this option said that sometimes AI tools like ChatGPT help them learn new words, transform their ideas into sentences, and polish their writing and style. 8 believe that they 'rarely' learn from their mistakes. According to them, using AI in writing is a short time experience; it is all about the final result product. Furthermore, one of the main reasons of using AI is to limit the time of writing. Using AI will reduce the steps of the usual writing process from 5 to 2, giving instruction and publishing. 3 out of the 20 students selected the option 'neutral'. Selecting this option means that the students have a balanced view. They don't strongly agree or disagree. In other words, they believe that these tools have benefits as they can have limitations. The rest said 'No, never'. Most of the students who selected 'never' may rely on ChatGPT to write their paragraphs with zero efforts. They give the AI engine the instruction, then they copy paste the written composition. They only check if the AI language model have completed the task successfully. The checking time is too short for learning new words or writing techniques.

The next question was how often do the students review or revise AI-generated suggestions before accepting them? 9 students said 'never'. This answer shows their complete trust and reliance on the machine. The uncovered results reflect the students' lack of confidence. The students feel insecure about their own abilities and skills. They know they have some language issues that they are supposed to work on in this course and the other related courses

but instead of facing this reality, they resort to the fast easy option namely AI-engines to do the required work unaware of the outcomes. Being unaware of the impact of this deed on limiting or ceasing critical thinking that gives individuality to the students; in addition, the accuracy and the perfection of the IA language generators' answers are all reasons that make the students ignore the revision. As a result, they find it difficult to evaluate the resulted suggestion. 7 students said rarely. These students said that they revise only when the topic that they are writing about is complex, or they are unfamiliar with, in this case, they revise to avoid situations like awkward pauses, mispronunciation, embarrassment etc. 3 students said that they sometimes revise what the AI- Language models generated. When they were asked why they said it depends on the time and the circumstances. If they have time, they would revise. But, if they don't have time, they won't revise. Furthermore, in certain circumstances, they revise when they are assigned to read their written compositions. Only one student selected 'often'. This student said that she revises because she believes that it is crucial to personalize the written composition. Consequently, it seems that most of the students under study do not revise their written compositions automatically generated by AI-engines. This conclusion means that the students have low self-confidence; on the other hand, they have high confidence in AI-engines. The low confidence stems from the lack of certain writing skills like lexicon, grammar, punctuation etc. the high confidence in the machine stems from the concept itself that the machine is more accurate than humans.

Next, the students where asked if they feel that AI-based tools encourage creativity in their writing, or do these tools limit it by providing ready-made solutions. 9 students see that these tools limit their creativity by letting the machine does what they are supposed to do. It seems that they know that these ready made paragraphs and essays that they are asked to write, but they don't and let AI to do it for them limit their critical thinking, creativity and the learning process. On the other hand, the majority of the students (11) think that these tools do not limit the creativity, on the contrary, they help them to learn new words, how to use punctuation, grammar etc. one of the students said that the world is changing and we need to be open to new learning tools and instead of having instructor monumental reviews we can have this instant reviews using the AI-Based tools. Another students said that these tools help him enrich his vocabulary and save time.

As can be noticed, the students under inquiry are unaware of the shortcomings of their over reliance on AI especially in the course of written expression that requires critical thinking, individuality and the constant work on the written skills to improve them. Their unawareness of the issue is due to the overconfidence in the machine. Generation z are known to be the generation of technology since they grew up with smart and digital technologies being part of their lives. They are used technology; therefore, they are unaware of the danger of AI. In addition, the students also lack ethical awareness. Since the students ask the AI language models to write their written assignments, they are unaware of the ethical implication. The lack of teachers guidance can be one of the factors leading to this reliance. The teachers, at the beginning of the academic year and the first written expression session, must dedicate this session to aware the students of the nature of the course and the danger of using AI in this course.

#### 3.2 The Analysis of the Teachers' Interviews

Three teachers were under study including the researcher. All the teachers teach written expression course for first and second year bachelor students. All the teachers face the same problem, namely, the students' over reliance on AI-based tools. The aim of interviewing the

teachers is to address this problem, discuss it and find solutions to it. The first question asked was the ways have led the teachers notice the students over-reliance on AI-based tools when asked to write paragraphs or essays. All the teachers said that the first sign was the noticeable difference in students' performance during regular classes compared to exams. In regular classes, their paragraphs and essays were nearly flawless, with no grammar, punctuation, or spelling errors. However, during tests and exams, there was a significant decline in their performance. Their writing was filled with errors in spelling, grammar, and punctuation, and even the flow of ideas became problematic. Consequently, the teachers concluded that during regular sessions the students are not the once who are writing the written assignments, and because the paragraphs were nearly perfect and flawless, the teachers knew that the students are using AI-based tools to generate their written compositions. Furthermore, when the teachers confronted the students they admitted.

The second question asked was if the teachers believe that AI tools help or hinder the development of students' writing skills. All the teachers agreed on that AI hinder the students writing skills. They believe that using AI in written expression course obstruct the students' skills and abilities development. In this session, students should make mistakes, identify their mistakes and correct them, and they should practice writing by knowing and following the five steps of the writing process. However, using AI in writing will resume the writing process in to two steps giving instruction to AI language model and publishing (the generated paragraph). Not only the students' critical thinking will be ceased, but they will also become dependable and addicted to the machine, limiting their individuality and creativity. The students became unprepared for non-AI situations; as a result, they struggle during exams and tests, and their performance is very weak since using digital tools like phones or tablets is forbidden. Another reason why AI hinders students' development is its superficial understanding. AI generate what students ask; however, it never explains why something is correct or wrong leading to superficial learning and understanding. Eventually, the students will not learn anything. In addition, students will miss out working on their language use and writing skills.

Then, the teachers were asked to suggest strategies to encourage students to critically engage with their own writing, rather than relying heavily on AI. The teachers suggested assigning creative writing assignments where students require original thoughts. Extend the written expression sessions to allow students to write in class and prohibit the use of digital tools during the sessions. Encourage the process of oriented-writing. The students are obliged to submit their outlines, drafts, revisions etc. to ensure that the students are following the natural process of writing and engaging critical thinking. The teachers also spoke about their role in guiding the students, instruct them and being with them during this journey. The teachers concluded that peer review sessions are also important in fostering critical thinking and self awareness about writing quality. The teachers emphasized the role of awareness in the first session of written expression in reducing the students' over reliance on AI in writing.

At the end of the interview, the teachers were requested to suggest solutions or strategies that would be recommended to reduce students' over-reliance on AI-based tools in the written expression course. The teachers' first suggestion was to aware students of the downfalls of such reliance by dedicating the first session to address this issue and to discuss it with the students. Preparing and printing brochures summarizing the issue and what was discussed in the lecture and putting it in PDF format in the official space of the course on Moodle platform, so the students can check it and download it later. Accessibility of the students to this document is very important. Define ethical consideration is another issue that need to be

discussed with the student. They need to be aware of the fact that asking AI to write the paragraphs and essays that they are supposed to write is unethical and not allowed. Perkins (2023) emphasized that students when using AI-based tools like ChatGPT, they need to be transparent and give credit, reinforcing honesty in their submissions. Another suggestion was to clearly communicate the course objectives and how auto-writing without the use of AI would foster their critical thinking, creativity, and improve their writing skills. Setting strict rules or penalties for using AI is another recommendation to deter students. One of the penalties can be course suspension. The teachers also suggested to minimize the number of students in written expression course that sometime surpasses 40 students per class, and turning these classes into workshops. Turning the regular classes to workshops will able the teachers to mentor the students effectively, guide them to develop their own style and voice, and provide them with feedback that would help them to improve. Stuart (2004) concludes that students receiving timely and specific feedback improve their analytical skills, especially when feedback is explanatory rather than just outcome-based. Extend the duration of the written expression course to allow students ample time to write their compositions in class. This will give them the opportunity to develop their paragraphs and review their work. Teachers will also have sufficient time to provide immediate feedback and guide students in improving their writing. Designing structured assignment was also suggested by one of the teachers. This kind of assignment would require individuality, critical thinking, and creativity, and it would be difficult to be AI-generated. Incorporating peer review is also another strategy that can be used by teachers where students provide constructive feedback to each other, reinforcing collaborative learning, making the lectures more engaging and rich. Consequently the students will be able to learn from each others mistakes. The points that were addressed by the teachers of written expression are key procedures that may help to reduce AI over reliance and draw boundaries especially in written expression course. The teachers started applying some of these suggestions. Future research will explore and examine if these procedures are effective or not.

#### 4. Conclusion

This piece of research highlighted a growing trend of the over-reliance on AI- based tools by university students in their assignments, focusing on first and second year bachelor students in written expression course at the University of Oran 2 Mohamed Ben Ahmed, Oran, Algeria. The study employed both a questionnaire addressed to 20 students, and semistructured interviews conducted with 3 teachers. The aim of the questionnaire was to uncover the causes and the opinions of the students regarding their over-reliance on AI in written expression course; on the other hand, the aim of the interview was to find solutions to this issue. The major aim of the study is to address this growing issue, irritating professors and universities globally. The findings revealed that the students under study are unaware of the shortcomings of the over-reliance on AI. It has been found that GenZ trust the machine over themselves since they are familiar with technology. It has been uncovered that such reliance stems from different reasons, such as the lack of language competence and real time feedback etc... It has been also found that the students are unaware of the outcomes of this reliance, such as hindering critical thinking, creativity, and individuality. In other words, this reliance will cease any learning or progression in this course which is based on critical thinking and creativity. To reduce the reliance, several measures were recommended by the teachers like to raise students' awareness by dedicating the first session to talk about this problems, preparing printed brochures, explaining the short-term and long-term outcomes of this reliance, communicating the course objectives, setting strict rules and penalties to deter the students, minimize the students number in written expression classes to ensure effective students

mentoring, control and guidance, extend the duration of written expression course, designing structured assignments, incorporating peer review etc. As it can be noticed, addressing this AI over-reliance requires a combination of policy enforcement, curriculum adjustments, and pedagogical strategies aimed at helping students develop as confident, creative, and independent writers. Future research could examine the suggested procedures and determine if they were effective or not, and they can also investigate the long-term effect of this reliance.

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### From Unsolvable Tasks to a Scorecard Approach: An Altered View on HEI Reputation Measurement

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#### Abstract

This conceptual paper addresses the strategic marketing challenge that Higher Education Institutions (HEIs) face in measuring and monitoring their reputations. A monitoring tool, the HEI Reputation Scorecard, is presented as a solution to the ongoing debates on how to capture the construct of reputation in the context of HEIs with just one or two indicators. Therefore, the construct of HEI reputation is discussed and divided into four sub-categories which are related to the main parts of HEIs: teaching, research, transfer and administration. The main part of the paper argues for the need and challenge of measuring HEI reputation. Based on the four sub-categories of HEI reputation, a scorecard approach to monitoring HEI reputation is developed. The anatomy of the tool, appropriate indicators and relevant procedures are outlined in detail. In addition, the process of developing a customised HEI Reputation Scorecard that takes into account different stakeholders is exemplified. The advantages of using the Reputation Scorecard and how to implement it in the HEI management process demonstrates the practical impact of the tool. Several implications for further research and practical application are highlighted.

Keywords: Reputation, Higher Education, Measurement, Controlling, Scorecard, Higher Education Management, Higher Education Marketing

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# Introduction: Focusing HEI Reputation and Its Control

Though managing and controlling the reputation of Higher Education Institutions (HEIs) seems to be a much-discussed topic, there are hardly any realizable approaches yet. Such necessity arises from the increasing competition in the educational market (Bagley & Portnoi, 2014; Musselin, 2018; De Wit & Albach, 2021) caused, among others, from deregulation (Hemsley-Brown & Oplatka, 2006; de Boer et al., 2007), globalization and increasing student mobility in its wake (Gibney, 2013), the funding of research and also of teaching (McGaffery, 2019). Musselin postulated the new forms of competition in higher education as "simultaneously individual, institutional, national and international" (Musselin, 2018, p. 660 f.). Whereas Wedlin (2008, p. 144) critically pointed out: "Marketization is a far-reaching process currently running through many societal spheres, including the university sector, and involving a widespread and deep transformation of society with economic, social and political dimensions.". HEI have to face the challenges of the HEI marketplace (McGaffery, 2019).

In such a competitive, international HEI marketplace, prospective and current students (Hemsley-Brown, 2012; Munisamy et al., 2014; Suomi, 2014; Suomi et al., 2014; Plewa et al., 2016), professors, or companies might rely on the reputation of an HEI as a criterion when choosing where to study, to work, or to corporate with an HEI (Lafuente-Ruiz-de Sabando et al., 2018), analogous to the idea of the reputation construct from business science.

This paper proposes a different way in measuring and monitoring HEI reputation. As HEI can be considered a subtype of *scientific organizations* (SO), the many particularities that have been discussed for SO thus also apply to HEI. Undoubtedly, SO have been characterized as having various features (e.g. Kotler & Fox, 1985; Finholt, 2003; Hoyle, 1982; Courtney et al., 1998; Musselin, 2006; Redler & Morschheuser, 2017; Ressler & Abratt, 2009; Leitner & Warden, 2004) which distinguish them from business or other administrative organizations. The definition of SO of Redler and Morschheuser (2017) shall serve as a starting point:

SO are tetra-sectional social systems that act goal-oriented, (that) produce knowledge or know-how, (that) use and defend scientific methods, (that) share their insights and ways of research with the public for the purpose of discussion, quality control and stimulation of further research, and (that) are embedded in a complex network of stakeholders.

However, HEI are a particular subtype of SO, characterized by a) a stress on the educative section in the tetra-sectional system (by offering different degrees after at least two to three years of study), b) a high complexity and a comparatively large size of the organization, and c) a micro-structure which is based on experts rather than formal authority in loosely coupled spheres (Redler & Morschheuser, 2017).

# **General Perspectives of Measuring HEI Reputation**

# HEI Reputation

As outlined by Amado and Juarez (2022), *corporate reputation* started to be taken into consideration in the early 1970s (e.g., Spence, 1973; Caves & Porter, 1977). Many researchers have conducted research in this area (e.g. Fombrun 1996; Fombrun & Shanley,1990; Walker, 2010; Fombrun et al., 2000; Fombrun & van Riel, 2003; Rao, 1994;

Carpenter, 2010; Bromley, 1993, 2002; Grunig & Hung, 2002; Deephouse, 1997, 2000; Gotsi & Wilson, 2001; Walker, 2010; Lange et al., 2011; Barnett et al.; 2006). An overview can be found in Redler & Morschheuser (2024).

However, research on *HEI reputation* management and monitoring is rather underdeveloped (Morschheuser & Redler, 2015; Watkins & Gonzenbach, 2013). This seems to be a significant shortcoming as, in an era of ongoing marketization, reputation is becoming a key *strategic objective* for managing HEIs, and as such needs to be subject to professional *monitoring*, accordingly, with adequate *measures* for HEI reputation also needed. Indeed, the measurement issue is pivotal to a reputation management logic (Waeraas & Byrkjeflot, 2012).

#### Measuring HEI Reputation: No Light at the End of the Tunnel

It is controversial whether reputation should be measured reflectively (e.g., Agarwal et al., 2015; Helm, 2005; Rossiter, 2002) or formatively (e.g. Fleuren et al., 2018; Diamantopoulos et al., 2008; Rossiter, 2002). Another point of discussion concerns the database used for reputation measurement, whether based on more "subjective" data (e.g., Kaiser, 2005; Siefke, 1998) or more "objective" data (e.g., Hinterhuber & Matzler, 2006; Siefke, 1998). Further discussions center on the measurement dimensions of reputation: Reputation as a first-order or a second-order construct (e.g. Agarwal et al., 2015; Dong et al., 2019; Walsh and Beatty, 2007; Yang et al., 2008a; Yang et al., 2008b; Danneels, 2016; Potter, 1991), using single or multi-item measures (e.g. Bergkvist and Rossiter, 2007; Bowling, 2005; Diamantopoulos et al., 2012; Loo, 2002; Sarstedt & Wilczynski, 2009; Svensson, 2008: Rossiter, 2002). Research on measuring the reputation of universities seems to be mired in endless debate (Redler & Morschheuser, 2024).

# An Alternative Measurement Approach for HEI Reputation: The HEI Reputation Scorecard

The discussion by Cornelissen and Thorpe (2002) has thus far demonstrated that the objective of identifying theoretically sound methods for measuring the reputation of HEI (in their research: business schools) remains a challenging endeavor. As shown, several challenges are at play in the attempt to do justice to the specifics of HEI, to integrate different dimensions of reputation, to meet the psychological quality of the construct, to find a valid measurement approach against the background of multiple and competing ideas and to satisfy the need to include qualitative ways of measurement. Indeed, the discussion on how to measure HEI reputation is still ongoing (see e.g., Verčič et al., 2016), but it is not delivering applicable frameworks for HEI reputation monitoring routines.

It is for these reasons that (as an alternative) a scorecard (SC) method is now introduced in order to break free from debates that seem to have reached a deadlock. The approach is based on the definition of HEI reputation according to Morschheuser and Redler (2017): *HEI reputation is the collective representation of an HEI that its multiple stakeholders hold over time and that leads to respect, trustworthiness, attraction, and support for the HEI.* 

As will be shown, the SC angle is valuable in that it allows for many distinctive requirements to be combined into one tool. In particular, the proposed framework takes into account the multidimensionality of reputation; and it explicitly caters to the principles by Cornelissen and Thorpe (2002):

- Tangible and intangible pillars of reputation are included (principle 1) such as financial and non-financial or psychological indicators. Image factors are important psychological indicators and to be part of the framework so it is clearly distinguished from reputation (principle 3).
- It also considers qualitative factors that complement quantitative indicators (principle 4).
- As different stakeholders have different information needs (e.g., for applying at a HEI as a student or employee), perspectives for various stakeholders are incorporated (principle 2).

The SC concept is not only a theoretically well-grounded framework but also has clear advantages in terms of applicability in HEI management practice for measuring and controlling reputation. This will be outlined in the next sections.

# Foundations of Scorecards as a Monitoring Tool for HEI Reputation

Generally, a SC compiles and monitors the most important key figures in a specific area. As innovative approach of a performance measurement system, the *balanced scorecard (BSC)* dates back to Kaplan and Norton (1992). The developers point out that "measurement was as fundamental to managers as it was for scientists" (Kaplan, 2009, p. 1253).

The main idea of the BSC is to improve the strategic management process by providing several key measures from dependent areas. For several years, Kaplan and Norton have developed and optimized the BSC tool. The newer versions include four perspectives: the financial, the customer, the internal processes, and the learning/growth perspective. Within these, quantitative and qualitative data, monetary and non-monetary figures, lagging, and leading indicators based on a hierarchical, causal system are combined (Kaplan & Norton, 1992). The causal system (the strategy map) as the underlying framework illustrates how the financial results can be achieved to create value for its shareholders if the organization is focused and strategically aligned. To generate shareholder value, a customer-focused organization operates with optimized internal processes implemented by motivated and engaged employees. This reflects the four BSC perspectives mentioned above.

In research and in practice, contributions of the BSC tool have already been discussed from different angles (e.g., Papenhausen & Einstein, 2006; Hladchenko, 2015; Taylor & Baines, 2012 or esp. Al-Hosainin & Sofian, 2015, provide a comprehensive review). For example, some authors analyzed a transfer of the BSC concept to state universities with different priorities. Then, Bauder and Jungen (2015) developed two extended BSC variants for research units and for teaching units. Based on economic efficiency aspects, they define and draw their findings from the demand-related economy (Bauder & Jungen, 2015). Beard (2009) came up with a multitude of measures that are used at two HEI: Based on an "adapted form of the BSC", as an integrated approach of performance management of the Malcolm Baldridge National Quality program, they developed a BSC based on six yield categories (p. 276) in the light of the ideas of Karathanos and Karathanos (2005). Another interesting idea was out forward by Reda (2017) who discusses "the congruence between the balanced scorecard and the quality assurance practices in higher education institutions" (p. 498). In total, the numerous and different approaches focus on performance management, another strategic perspective or discuss the adaption of the key perspectives of the BSC.

# Deriving a Scorecard for HEI Reputation

The initial considerations of this paper acknowledge HEI as subtypes of SO and refer to a definition of HEI reputation that adapts the (above introduced) understanding of SOs' reputation by Morschheuser & Redler (2015).

Following the SC view has several advantages. The SC will help to operationalize the construct reputation so that measures evolve, as a first plus. As a second benefit, the SC solution with its underlying idea of being grounded in a strategy map (that managers need to have a clear idea of) will help to increase awareness of priorities within the multitude of suitable measures. The third advantage is that the SC approach is linked to the process-character of reputation building and management, so that putting the emphasis on strengthening the reputation is supported as a matter of course. On the other hand, the HEI Reputation Scorecard (HEI RepSC) is a rather pragmatic and heuristic way to pave the way towards HEI reputation monitoring. Above all, it is an alternative way of thinking that may lead a way out of the deadlock mentioned above.

The structure and use of a SC in general follows a simple scheme. Each of the four perspectives is assigned to approximately five key figures or metrics. In use, target values are defined for each key performance indicator (KPI), and the actual values are measured. Based on target-actual comparisons, (strategic) activities are derived to better achieve the target values.

As explained earlier on, the reputation of HEI builds on four sub-reputations (perspectives) depending on the main (strategic) focus of the HEI: Reputation in teaching, research, transfer, and administration (RepT, RepR, RepTr, RepA; Morschheuser & Redler, 2015, 2017). Taking these sub-reputations as the inherent perspectives in the HEI RepSC concept, the sub-reputations can be characterized by several key figures or indicators. Further, different strategic foci may result in different HEI RepSCs. E.g., a more research-oriented university might be particularly interested in achieving research reputation, because that is the focus or the strategic alignment. Therefore, indicators such as the number of publications or the acquired research funds will be prominent in this specific HEI RepSC. Other HEIs with an emphasis on innovative teaching techniques and methods might rather find indicators for subject area and higher education didactics competences their more suitable indicators.

In order to apply the HEI RepSC idea, HEI managers need to follow steps (a) - (c) as explained below. Firstly, possible key figures, (a) indicators and measurement methods need to be assigned to the four perspectives RepT, RepR, RepTr, RepA, without asserting completeness. It is worth mentioning that from the multitude of possible indicators, only those should be selected that seem suitable for the HEI in question and also express its strategic orientation. Then, a procedure model of a HEI RepSC (b) needs to be set up that outlines a viable reputation management process. Finally, for the chosen perspectives and indicators, actual values (c) have to be collected, target values have to be defined and activities for achieving these target values have to be derived. Consequently, feasible indicators related to the four perspectives of HEI reputation are briefly drafted.

# Indicators of Teaching Reputation (RepT)

Indicators which refer to good or bad teaching reputation can be found in different studies or rankings (e.g., QS, 2019; Collins & Park, 2016). If stakeholders search for HEI with a good

teaching reputation, most of them look at rankings. A prominent example is the Times Higher Education Ranking. It offers different types of rankings with a variety of perspectives (overall, teaching, research subdivided for e. g. undergraduate, master, doctorate). It combines five factors to generate a teaching ranking reputation survey: 15%, Staff-to-student ratio: 4.5%, Doctorate-to-bachelor's ratio: 2.25%, Doctorates-awarded-to-academic-staff ratio: 6%, Institutional income: 2.25% (THE, 2020). As "measuring scholarly reputation is now being challenged, changed, and widened by Science 2.0 developments, which harness information-sharing and collaboration activities" (Nicholas et al., 2015, p. 169), corresponding indicators need to be integrated, e.g., offered MOOCs, videocast, podcasts.

Furthermore, surveys are proven instruments that can be used in the context of reputation. In addition to institution-specific surveys, cross-national surveys may serve as indicators, e.g., the National Survey of Student Engagement (NSSE). "The survey assesses the extent to which students engage in educational practices associated with high levels of learning and development" (National Survey of Student Engagement, 2021). The instrument is administered annually in the United States and Canada. Further surveys for measuring student's engagement are presented by Lutz and Culver (2010), or by Gakhal (2018) for teaching excellence, as an example.

# Indicators of Research Reputation (RepR)

To measure the reputation of research, the impact factor is one idea. The more often an article is quoted, the more important the article seems to be. The original idea was developed by Garfield (2006). "It is widely accepted in academia that journal publishing is a very good example of output being an indicator of reputation" (Baden-Fuller et al., 2000, p. 629). Their research over four years analyzed authors and business schools mentioned in selected business journals and compared the results with business school rankings. Thelwall and Kousha examined "that rankings based on ResearchGate statistics correlate moderately well with other rankings of academic institutions, suggesting that ResearchGate use broadly reflects the traditional distribution of academic capital". (2015, p. 876). Meanwhile, a controversial debate has been waged (e. g. Bornmann & Marx, 2013). To focus only on bibliometric data won't address the manifold aspects of research reputation. The storm of outrage over the University of Liverpool's decisions to cut research positions fueled the discussion that resulted in a manifesto back in 2005 (Hicks et al., 2005) to consider qualitative criteria as well.

# Indicators of Transfer Reputation (RepTr)

The transfer sector has only recently been given greater importance. Since 2014, for example, transfer has been included in a ranking initiated by the EU, U-Multirank, with indicators of regional engagement and knowledge transfer. A total of over 100 indicators are included (U-Multirank, 2021). Reputation in the transfer sector can be seen in the quantity and quality of cooperation with companies, start-ups or patents used in products. Another criterion could be the number of start-ups arising from the university environment, which is fostered by the large network of affiliations and cooperation. The application of research in practice, in particular, has the potential to positively influence the attention and reputation of the HEI. In the more market-oriented Anglo-Saxon world, universities have always been more closely integrated into economic and social contexts with third mission activities (education programs, services, community activities or third stream) (Himpsl, 2017).

# Indicators of Administration Reputation (RepA)

High economic performance, short processing times or customer friendliness can influence the reputation of an administration for HEI, too. HEI reputation is certainly enhanced when programs are successfully and expeditiously accredited or when private donations are profitably invested to fund scholarships. Harvard Business School, e.g., is known for its investment strategy of their endowments (Azlen & Zermati, 2017).

Support for disadvantaged students, diversity, and inclusion of students and also employees also contribute to reputation. As an example, the Diversity Audit of The Stifterverband advises universities as to designing structures, instruments, and measures to include diverse groups of people in everyday university life (Stifterverband, 2021).

# The Stakeholder-Sector Grid As Developing Basis for HEI RepSC

The previous sections argued how the SC idea can be applied to the challenge of controlling and measuring HEI reputation. For that, four SC sections have been proposed which correspond to the sub-dimensions of HEI reputation. In addition, possible indicators for each section were presented as examples. The following passages will now look at how to connect the SC with the various stakeholders that need to be considered, and the procedural approach that is inherent in the SC theory. Also, a brief example is given.

Relating the different stakeholder perspectives relevant to the HEI reputation to the specific sub-reputations discussed above results in the stakeholder-sector grid as depicted in Figure 1. The exhibit also illustrates potential indicators that might influence the specific sub-reputations and that cater to the various stakeholders. Some of the indicators refer to all stakeholders (they are designated as general indicators and may be found in the first column of the grid in Figure 1).

Stakeholder Sectors	Students, Prospective students, alumni	Prospective employers, Companies	Academic employees, Non-academic employees, Professors	Ministry of science, Research funding institutions	Society
Administration <ul> <li>Cost per student</li> <li>Invest in Infrastructure</li> <li>Number of staff</li> </ul>	<ul> <li>Evaluation of Admin</li> <li>Student-Staff- ratio</li> <li>Diversity</li> <li>Inclusion</li> <li>Scholarships</li> </ul>	<ul> <li>Survey</li> <li>Customer orientation</li> </ul>	<ul> <li>Institutional Income per staff</li> <li>Student-staff ratio</li> <li>Study/Survey</li> </ul>	<ul> <li>Economic Performance</li> <li>Attaining objectives</li> <li>Institutional Income</li> </ul>	Economic Performance     Funding Programs
Transfer <ul> <li>Number of Cooperation</li> <li>Number of Start-ups</li> </ul>	<ul> <li>Evaluation of Transfer</li> <li>Alumni as founders</li> </ul>	<ul> <li>Successful Cooperation</li> <li>Media analysis</li> </ul>	<ul> <li>Amount of funding obtained</li> <li>Survey</li> </ul>	<ul> <li>Cooperation partner</li> <li>cooperation projects</li> </ul>	<ul> <li>Third Mission Contribution</li> <li>Extra-University Engagement</li> </ul>
<ul> <li>Research funding</li> <li>Number of Patents</li> <li>Number of Publications</li> </ul>	<ul> <li>Evaluation of Research</li> <li>Lectures at Conferences</li> <li>ResearchGate, Academia membership</li> </ul>	<ul> <li>Media analysis</li> <li>Well known Researcher</li> </ul>	<ul> <li>Journal Impact Factor (JIF)</li> <li>h-index</li> <li>Qualitative Survey</li> <li>Number of Conferences</li> <li>ResearchGate, Academia membership</li> </ul>	<ul> <li>Patents</li> <li>Awards</li> <li>Media analysis</li> <li>Qualitative Survey</li> </ul>	<ul> <li>Awareness for Research (Media analysis)</li> <li>Awards for Research</li> <li>Scientific advisory functions</li> </ul>
<ul> <li>Teaching</li> <li>Number of Teaching awards</li> <li>Mentoring ratio</li> <li>Days for qualifications</li> </ul>	Evaluation of Teaching     Invest in library     Academic grades     Number of MOOCs, Videocast, Podcast     Recommendation of alumni     Survey	<ul> <li>Survey</li> <li>Alumni as employees</li> </ul>	<ul> <li>Teaching hours</li> <li>Teaching resources and support</li> <li>Survey</li> <li>Invest in digital equipment</li> </ul>	<ul> <li>Time to graduation</li> <li>Drop-out- rates</li> </ul>	<ul> <li>Awards for Teaching</li> <li>Well known Alumni</li> <li></li> </ul>

Figure 1: Stakeholder-Sector-Grid

Overall, the stakeholder-sector grid suggests a range of qualitative and quantitative as well as monetary and non-monetary criteria. According to the discussion of corporate reputation measurement by Baumgartner et al. (2022) relying on Bayer et al. (2017), distinguishing between direct or indirect content factors, the following grid mainly contains indirect reputation criteria which refer to the dimensions of reputation (e.g., cooperation partners as indirect factor). Backward and forward locking criteria as discussed in Bayer et al. (2017) are also included in the grid (e.g., vision and goals as forward looking criteria).

The stakeholder-sector grid (see Figure 1) contains various factors or KPI that can impact on the (sub-)reputation. This KPI collection is to be completed successively and serves as a source of ideas for creating a specific HEI RepSC for a specific HEI. Moreover, the grid also makes clear that the KPIs are to be viewed and collected from the perspective of various stakeholders. *The grid serves as a starting point for developing an individual, specific reputation SC for HEI*. Figure 2 depicts an example of a fictitious HEI RepSC. As seen, it brings together four viewpoints on reputation that refer to four sub-reputations. Each is represented by several indicators which are expressions of the relevant perspective.

പ്പ	Objectives	Target	Current	Status	= • • • •	Objectives	Target	Current	Statu
<u>}</u>	Student-Staff Ratio	2%	3%	•	E.	Number of Cooperation	3	4	
<i>™</i> _	Cost per Student	20 T&	25 T\$	•	<u> <u> </u></u>	Number of Startups	6	4	•
	Institutional Income/Staff	500 Mio. \$	550 Mio \$		Transfer	Funding Obtained	95 Mio, \$	90 Mio. \$	•
Admini-	Number of Staff	500	500			Awards Teaching	2	4	
stration	Number of Staff	500	500			Awards reaching	,		-
stration	Number of Staff	500	500	-	$\sim$	Awards reaching	3		-
stration	Objectives	Target	Current	Status		Objectives	Target	Current	Status
stration	Objectives Teaching hours	Target 10h/week	Current 9 h/week	Status		Objectives h-Index	Target 30	Current 20	Status T
stration	Objectives Teaching hours Drop-out-Rates	Target 10h/week 5 %	Current 9 h/week 5,5 %	Status V		Objectives h-Index Number of Patents	Target 30	Current 20 4	Statu:
stration	Objectives Teaching hours Drop-out-Rates MOOCs	Target 10h/week 5 % 9 lectures	Current 9 h/week 5,5 % 9 lectures	Status V		Objectives h-Index Number of Patents Research Funding	Target 30 10 50 Mio. \$	Current 20 4 70 Mio. \$	Statu:

Figure 2: Example Rep Scorecard

All stakeholders should be involved in the development of a HEI RepSC. This is the only way to develop a comprehensive yet specific instrument. The starting point of the process is the strategic orientation of the HEI to define how important which sub-reputation is and whether there is a focus, if necessary, e.g., on teaching. How these considerations might be implemented into practical application in HEI management will be exemplified in the following section.

#### A Proposal for an HEI RepSC Process

As argued, the stakeholder-sector grid (Figure 1) serves as a basis and inspiration for deriving a specific HEI RepSC. This needs to be rooted in the strategy process as mentioned above. During the strategy development process of an HEI, the reputation status quo should also be discussed as HEI reputation reflects the collective perception of its stakeholders. The HEI RepSC process is embedded in the strategy process of HEI. Based on strategic management methods like SWOT analysis, stakeholder analysis, or competitor analysis, the key objectives and the strategy of the HEI are developed. Furthermore, a clear picture of the relevant stakeholders of the HEI needs to be developed. It goes without saying that the strategy management process and the reputation management process are closely linked. The strategic orientation and the associated strategic goals are reflected in the desired reputation or sub-reputations (see Figure 3).



Figure 3: Reputation Process

As a starting point for the reputation process, criteria, or indicators per sub-reputation and per stakeholder group are discussed and derived in a joint workshop with representatives of the various stakeholder groups. In doing so, the stakeholder-sector grid can serve as a basis for the discussion. It is important that the requirements for the indicators are taken into account accordingly. The relevant indicators can then be deduced and specified for the four sectors of the HEI RepSC. A set of 3-5 KPIs per sub-reputation should then be available as a result of the workshop. For this set of factors, the first HEI RepSC, the *current values* are then determined, and the results recorded (*HEI SC t=0*) (see Figure 4).



Figure 4: Reputation Process

The resulting first HEI RepSC serves as a measuring and controlling instrument and should be used in a cyclic approach. This procedure compares to the process of the BSC (e.g., Butler et al., 1997). In other words, the application of a HEI RepSC is to be seen as a continuous process. Building on *an initial status measurement* of the HEI RepSC indicators (t=0), the HEI management is to discuss objectives for each included indicator. Based on these and the strategy or vision of the HEI, tailored reputation initiatives should be defined and implemented by the organization. As a result, a new status will follow in the subsequent time period (t=1), and so on (see Figure 5). This will also allow for bringing together reputationrelated efforts, on the one hand, and reputation change, on the other hand. Of course, a timelag must be taken into account.

#### **HEI RepSC: A Conclusion**

In conclusion, our elaboration tried to clarify the architecture of a HEI RepSC and its application as a monitoring tool. The proposed concept, moreover, encompasses relevant perspectives of reputation, potential indicators, and significant stakeholders. In addition to this, particular emphasis was placed on the procedures which are inherent in the approach. All in all, the HEI RepSC approach is a smooth but comprehensive tool to measure, track, and manage HEI reputation with its multiple facets and complex interdependencies. The altered perspective might serve to avoid and escape from the dead end resulting from the measurement debate reported in the first part of this paper.

Using this HEI RepSC, university managers will be able to track the reputation status and to use it as a controlling tool. The HEI RepSC also provides a focused and transparent overview of the current reputational situation. Depending on the stakeholder group, some criteria may have conflicting characteristics, which need to be reflected and discussed in a workshop setting.
However, the offered concept can only serve as a first and still rough sketch and is intended to stimulate further discussion.

#### Implications

HEI face increasing global competition. This is only one reason why HEI need to improve their strategic orientation - and need to put a clear focus on reputation management, trying to outshine and outdo others with a good and unique reputation. The latter requires tools to monitor reputational performance.

As a starting point, it might be recommended that HEI managers take reputation into serious account as an important asset that needs careful and committed management and control. Additionally, managers should be open to deal with the complexity of the topic and try to come to terms with it rather than following wrong simplifying solutions. There is no reason to get intimidated by the many "That does not work" calls out there. In particular, the HEI management should be careful not to blunder into the trap of focusing on one or two subdimensions of reputation only, or to only focus on a small selection of stakeholders. Rather, managers are encouraged to take a sophisticated approach and to use the SC to cover different angles and thus get a holistic measurement of the valuable reputation asset. For this purpose, HEI management is encouraged to work on monitoring HEI reputation with the help of the HEI RepSC. As is so often the case, this means not taking the easy way but working on a HEI-specific strategy map first. Such a map should be seen as a core requirement for managers to understand how qualitative drivers influence quantitative indicators - as well as market and financial performance. Doing so, executives will find a HEI-specific SC architecture. HEI managers could start with core indicators for the several perspectives a SC has, first of all. If they bear in mind that these need not only be quantitative indicators, and if they could try to advance the tool step by step, quick wins might be gained. However, they should, by all means, avoid overloading the SC. Using a SC usually means to identify the key focus. Finally, the discussions showed that it might be of more benefit to implement a reputation management process which complements the strategic management process. This might help to showcase the influence and the impact of each organizational unit on the reputation of a HEI. Transparency will thus be fostered, and performance monitoring will then be easier.

However, the HEI RepSC as presented in this paper is only a starting point for further elaboration and practical testing. Considering this, important limitations need to be recognized.

#### **Disclosure Statement**

The authors report there are no competing interests to declare.

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#### AI-Enhanced Transformative Approach to ESP in Engineering Education

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#### Abstract

Transformative learning is an underlying theory in various aspects of contemporary language pedagogy, the field of teaching English for specific purposes (ESP) is no exception. When applied to the ESP curriculum, transformative learning can have significant pedagogical implications and it can be beneficial for engineering students, as it follows their specific needs. Due to digitalization processes in higher education institutions, it has become crucial to study the current dimensions of transformative learning in ESP in engineering education and whether its implications support new forms of learning such as AI-powered tools. The main aim of the present research is to examine student opinions about the incorporation of AI technology in the ESP course and assess if AI technology can facilitate transformation. The article overviews the theory of transformative learning, discusses transformative goals, gives examples of how transformative learning can be enhanced through AI technology, and investigates engineering students' opinions about AI technology implementation. The results of the study were obtained in a survey, involving 137 undergraduate and postgraduate engineering students of different engineering programs at Latvia University of Life Sciences and Technologies. The data obtained indicate a strong overall approval of AI integration into the ESP course and reveal the potential of AI to foster transformation. The findings of this research can be used by ESP teachers to revise methods and content promoting transformative learning outcomes.

Keywords: Engineering Education, Transformative Learning, English for Specific Purposes (ESP), Artificial Intelligence (AI)

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#### Introduction

Transformative learning is a theory about how adult people learn and how they make sense of their life experiences. This theory was introduced by the American sociologist Jack Mezirow in 1978 and since then it has gained great popularity in the fields of pedagogy and research. Transformative learning theory focuses on 'personal transformation', suggesting that learning experiences can dramatically change a learner's way of thinking, and cause a shift in perception and reconsidering of beliefs, values, and assumptions. Transformation is "about change, dramatic, fundamental change in the way we see ourselves, and the world in which we live" (Merriam, 2004, p. 60).

In transformative learning, students take an active role in their learning process, they take control of it, and become more self-directed and autonomous. The learners undergo a complicated process of conscious change reassessing beliefs, values, and assumptions, engaging in critical discussions, collaborating with peers, critically analyzing different perspectives, and evaluating their experience by reflecting individually and with other learners (Cranton, 2016; Mezirow & Taylor, 2009).

The goal of adult education which the teacher must address, in Mezirow's view, is 'the process of helping learners become more aware of the context of their problematic understandings and beliefs, more critically reflective on their assumptions and those of others, more fully and freely engaged in discourse, and more effective in taking action on their reflective judgments (Mezirow, 2000).

The role of the teacher in transformative learning is to:

- provide a supportive and inclusive environment and facilitate the learning process;
- involve learners in experiential learning;
- provide learners with activities in which they are transformed through their collaboration;
- encourage critical discussions to examine information from different perspectives to form new insights;
- involve the learners in active and reflective learning experiences;
- encourage trying new roles and behaviors;
- encourage articulating arguments and supporting them with appropriate evidence;
- encourage the learners to analyze experience by reflecting, evaluating, and reassessing it individually and together with their groupmates;
- encourage the integration of newly found perspectives and behaviors into daily life, testing their validity. (Adria, 2009; Alhadeff-Jones, 2012; Apte, 2009; Sinkus, 2019)

Thus, transformative learning focuses on how adults can undergo personal transformation through education. The idea is that learning isn't just about gaining knowledge; it's about fundamentally changing the way students think and see the world. It's especially relevant in ESP, where the goal is not only to teach language but to foster critical and reflective thinking and professional communication skills in a specialized field like engineering.

This article focuses on how AI technology implementation in ESP can promote transformative learning in engineering education. The main aim of the present research is to examine student opinions about the incorporation of AI technology in the ESP course and assess if AI technology can facilitate transformation.

# Facilitating Transformative Learning in the ESP Course for Engineering Students Through AI Tools

The use of AI as a tool and assistance is growing and requires engineers to enhance their digital skills including data and AI competencies, therefore higher education institutions should complement current engineering curricula with these competencies (Schleiss, 2022). Research has shown that AI technology represents a significant advance in teaching methods and can be successfully implemented in foreign language learning, including ESP for engineering students (Patty, 2024; Rahimi & Fathi, 2022). ESP instructors are now incorporating AI technologies to create immersive language learning environments that actively engage learners and facilitate language learning processes (Alqahtani, 2018; Shadiev et al., 2023).

In the last few years, a wide variety of AI tools for foreign language learning have appeared, including AI-generated content, chatbots, machine translation, speech recognition, etc. AI technologies can enhance the development of linguistic knowledge, and improve students' reading, listening, speaking, and writing skills (OECD, 2024). AI tools can help learners boost vocabulary and grammar knowledge (Utami et al., 2023). Moreover, they can tailor English learning activities to the specific needs of students and enhance the learning experience by producing tasks for different proficiency levels or purposes and enabling personalized communicative learning processes (Chun et al., 2016; Shatri, 2020).

As discussed in the introduction section, one of the goals of transformative learning is creating opportunities for active and experiential learning, as engineering students learn best through the practical application of the foreign language in dealing with real-life engineering problems.

Integration of AI tools into the ESP course curriculum allows engineering students to engage actively in authentic engineering tasks and apply theoretical knowledge to experience real-world engineering situations. Students can take part in such hands-on activities as engineering discussions, case studies, simulations, and conducting research. These practical tasks engage students in interacting with AI technology, developing their critical thinking and problem-solving skills, enhancing their understanding of engineering concepts, and promoting English language proficiency.

Language learning applications powered by AI such as LanguaTalk, TalkPal, Babbel, and Mondly can be used in ESP to meet engineering students' professional needs and individual language proficiency levels and provide them with meaningful foreign language experiences. Utilizing AI language learning apps in ESP can provide numerous benefits for developing engineering students' English skills including:

- a variety of engineering field-related topics, e.g. environmental engineering, computer science, civil engineering, etc.;
- developing professional vocabulary through modules focused on engineering terminology;
- practicing English communication skills and doing exercises that simulate professional communication scenarios in authentic settings, e.g. writing professional emails, participating in meetings, and giving presentations;
- developing professional writing skills, practicing writing technical documents in English, reports, and getting instant feedback on grammar accuracy, vocabulary, punctuation, and style;

- providing interactive speaking practice tasks doing which students can practice pronunciation and fluency in a relevant engineering context;
- progress tracking features for monitoring language use and receiving feedback and guidance.

Incorporating AI tools in ESP enables learners to actively engage in English language learning through participation in real-world engineering contexts. This meaningful experience not only facilitates the skills vital for engineering students' professional success but also fosters transformative learning.

Another goal of transformative learning is to provide opportunities for reflective thinking. Active participation of students in the self-evaluation of their learning and the development of reflective thinking are the key features of successful learning (Kavaliauskiene et al., 2012). Critical reflection in ESP involves becoming more autonomous and independent, organizing and planning meaningful language learning, setting and adjusting language learning goals, tracking progress, monitoring language learning motivation, choosing the most appropriate learning strategies, recording and analyzing learning experiences, identifying challenges and mistakes, evaluating learning and making further improvements in the language learning process.

AI technology offers a variety of opportunities to support students' reflective thinking. It can provide prompts to encourage deeper reflection on learning experiences and help students reassess their assumptions about learning the foreign language and incorporating innovative solutions into the ESP course. Engaging in reflective practices in the ESP course, learners can explore ways AI can be used to enhance their foreign language proficiency and engineering skills, this helps students better understand and adapt to new ways of learning and become more effective communicators in their domain.

Prompted by AI tools such as Reflectly, Journey.ai, Reflect.ai, and Daylio students can get instant feedback on their foreign language performance and professional communication skills, enhancing their reflective thinking and self-assessment. Such feedback provided by AI might relate to:

- the appropriateness of technical vocabulary and terminology used;
- the effectiveness of presentations, meetings, and negotiations in an engineering context;
- the clarity of technical writing, considering organization, use of grammar, technical vocabulary, coherence, and cohesion;
- cultural understanding, the appropriateness of language use in intercultural communication in various engineering contexts with engineers from other countries.

Thus, AI tools can be very useful in ESP as they present a range of opportunities for enhancing reflective practice and in this way fostering transformative learning. Utilizing AI technology students can analyze and evaluate their English use in various engineering contexts independently and together with other learners, developing a deeper understanding of the significant role of the foreign language in their engineering career.

Another essential goal of transformative learning is to promote student collaboration and encourage critical discussions. This process allows learners to explore and exchange different perspectives and validate their ideas through dialogue and debate, thus fostering new insights and a deeper learning experience. Research has shown that AI technology enhances student real-time communication and collaboration, fosters teamwork and creativity, facilitates team building, coordinates various team activities, manages tasks and task interdependence, supports decision-making, monitors performance, and even acts as an emotion regulator for a team in resolving conflicts (Khakurel & Blomqvist, 2022).

Participating in teamwork with other engineers involves the assessment of beliefs, feelings, and values and therefore can lead to learner transformation. Working together on engineering tasks, students can engage actively in meaningful discussions and collaborative problemsolving in this way developing their English language skills and enhancing their understanding of engineering concepts.

Chatbots such as Chat GPT, Discourse, Replika, or Tandem involve engineering students in collaboration in ESP in the following ways:

- offering multiple interactive features and engaging students in discussions and exchanging diverse perspectives on various engineering topics, e.g emerging technologies in engineering (renewable energy systems, artificial intelligence, nanotechnology, etc.) and their potential applications; ethical issues and challenges in engineering, sustainability issues (green technologies, strategies for mitigating environmental impacts, etc.);
- serving as a virtual assistant, guiding group discussions, facilitating efficient collaboration, task allocation, and helping students with problem-solving;
- providing feedback on how to improve communication in professional settings;
- enhancing student understanding of complex concepts in the engineering domain and offering language learning support by providing explanations, clarification, examples, and practice exercises related to English grammar and professional vocabulary;
- helping to overcome language barriers.

Thus, AI tools can promote collaboration in ESP and in this way facilitate engineering students' transformative learning. AI tools can engage them in discussions, and problemsolving activities that require the use of English to analyze engineering concepts or collaboratively solve real-life engineering problems.

To sum up, complementing the ESP course with AI tools can foster transformative learning as students encounter opportunities presented by technology. Through experiential learning, reflective thinking and collaboration students experience deeper and more impactful learning and develop the skills, attitudes, and values necessary to become successful engineers and proficient English communicators.

#### **Investigating Student Opinion on AI Tools' Application in the ESP Course**

To investigate engineering students' views on technology implementation in the ESP course, and to assess its potential for transformative learning, AI tools were integrated into the syllabus of the ESP course to complement traditional teaching methods. The course syllabus was structured into two parts: 80% traditional face-to-face learning and 20% individual work using AI tools. The topics of the ESP course were introduced and discussed during in-person seminars. To consolidate this newly acquired knowledge, students used AI to engage in open-ended conversations on industry-related topics and practiced new vocabulary with a chatbot.

The students chose an AI tool from those available to them, in most cases they selected ChatGPT, Perplexity, Midjourney, TalkPal, or Smalltalk2me.

A survey was conducted with 137 respondents comprising 83 undergraduate students of such engineering programs as Information Technologies for Sustainable Development, Computer Control and Computer Science; 37 postgraduate students specializing in Information Technologies, Environmental, Water and Land Engineering, Forest Science, and 18 PhD students of such programs as Information Technologies, Agricultural Engineering, Environmental Engineering, Food Science.

As seen in Figure 1, the results of the survey show a very positive attitude of students toward AI integration into the ESP course. The most common advantages highlighted by the students were active and experiential learning, valued by 113 students 82.5 % (113 students), motivating learning process, valued by 74.5 % (102 students), supportive and inclusive learning environment, valued by 72.3% (99 students). Other advantages were engagement in collaborative problem-solving, appreciated by 67.2 % (92 students), the opportunity to discuss engineering problems critically, appreciated by 65% (89 students). Also, students appreciated promoting English language proficiency, supported by 56.2 % (77 students) and developing autonomy and independence, supported by 51.8% (71 students). Improved confidence in English was acknowledged by 48.9% (67 students) and 41.6% (57 students) acknowledged an opportunity to solve real-life engineering problems.



Figure 1: The Advantages of AI Technology Application in the ESP Course According to Engineering Students

These findings highlight the potential of AI to foster transformation. The identified attributes—active engagement in experiential learning, enhanced motivation, inclusive learning, critical and reflective thinking, development of autonomy and independence, and collaborative problem-solving are crucial in modern education. These attributes align with the core principles of transformative learning and serve as indicators of transformation. Therefore, it can be concluded that the application of AI technology in the ESP course promoted transformative learning.

#### Conclusion

Implementing transformative learning into the ESP curriculum can have significant implications for the education of engineering students as it presents opportunities for continuous intellectual growth and self-improvement, the development of autonomy, self-directedness, and critical and reflective thinking. Student engagement in experiential, critically thoughtful, reflective and collaborative language learning experiences transforms the way they learn from a passive accumulation of information to its active usage in problem-solving in academic and professional contexts.

The use of AI in language learning is not just a trend, it is an innovation with the transformative potential to enhance educational experiences. AI-powered tools and traditional language learning techniques are not mutually exclusive, they act as complementary. Combining the advantages of traditional teaching methods with AI technology enables ESP teachers to create a more flexible, personalized, and inclusive language learning environment for their students, which leads to improved learning outcomes and helps students for professional success in an increasingly technology-driven world.

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#### Building a Skilled Workforce: Navigating Challenges and Opportunities in Palestine's Vocational and Technical Education System

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#### Abstract

The main aim of the research was to evaluate the existing status of vocational and technical education in Palestine, specifically focusing on the challenges and obstacles identified by experts. The study sought to investigate these issues by taking into account various factors, such as educational background, gender, and years of experience. The research aimed to assess the condition of vocational and technical education in Palestine by gathering insights from experts. A survey comprising 80 questions across six categories was developed to delve into different aspects, including the significance of vocational education, societal perceptions, alignment with the job market, school prerequisites, conformity with labor market demands, and institutional backing. The participant pool consisted of 91 experts chosen randomly from university professors in Palestinian educational institutions. Employing a descriptive approach, the study findings revealed that the experts' responses regarding the state of vocational and technical education in Palestine, particularly the challenges and hurdles as perceived by experts, indicated a high level of importance attributed to vocational education and a moderate level of societal perspective, vocational education, labor market alignment, school vocational education prerequisites, alignment of outcomes with labor market needs, and institutional support for vocational education. The results demonstrated no variations in the viewpoints of experts based on educational qualification and gender. At the same time, variances were observed in expert opinions based on experience in terms of societal perception, vocational education, labor market alignment, and the overall score, favoring individuals with five years or more of experience.

Keywords: Challenges, Opportunities, Vocational, Technical, Education

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#### Introduction

Vocational and technical education plays a crucial role in equipping students with cognitive, educational, and skill-based training, thereby facilitating economic development, enhancing investment opportunities, and providing employment prospects that align with the demands of the labor market. As a pivotal component of human resource development, technical and vocational education significantly contributes to achieving sustainable development in both economic and social spheres.

The Convention on Technical and Vocational Education, established by UNESCO in 1989, provides a comprehensive definition of technical and vocational education as an integrated educational process encompassing a broad spectrum of knowledge, technological studies, scientific skills, practical expertise, and professional attitudes essential for effective engagement in economic and social sectors. Recognized as a pivotal driver of financial advancement, vocational and technical education plays a fundamental role in optimizing workforce utilization within the labor market. To remain abreast of local, regional, and global scientific and technological advancements, it is imperative to enhance and prepare vocational and technical education by prioritizing quality assurance, ensuring the production of highly skilled graduates, and striving to elevate educational standards to meet the evolving demands of the labor market. The primary objective of technical and vocational education is to enhance productivity, enhance job satisfaction, foster self-assurance, and cater to the requirements of stakeholders in production (Halabi, 2012).

Akinlade and Olufayo (2022) and Wibowo and colleagues (2022) underscore that technical and vocational education involves the acquisition of knowledge in sciences, technologies, skills, and practical attitudes relevant to diverse jobs in economic and human sectors. Vocational education programs aim to cultivate foundational skills at lower educational levels, preparing students for progression into higher-level roles.

Ongoing efforts by pertinent ministries to expand and enhance existing vocational institutions, establish new educational entities, and implement contemporary education and vocational training models aligned with market demands are currently underway. These initiatives involve the development of programs and curricula utilizing modern methodologies tailored to market needs, the introduction of new specializations for female students, and the enhancement of employment prospects for vocational program graduates. Employers actively contribute to shaping these initiatives. The strategic vision for vocational and technical education aims to refine and strengthen the technical and vocational education system, nurturing a skilled and motivated workforce. The overarching educational strategy emphasizes the facilitation of educational enrollment, the enhancement of educational quality, and the alignment of educational offerings with market and societal requisites across diverse sectors, as outlined by the Ministry of Education and Higher Education in 2014.

In Palestine, the oversight of technical and vocational education institutions is distributed across various bodies, including the Ministries of Education, Higher Education, Labor, international organizations, governmental bodies, both private and public educational institutions, and other relevant authorities. Despite concerted efforts by the State of Palestine to enhance technical and vocational education, equipping students with the necessary skills and technical knowledge demanded by the labor market, this sector continues to face ongoing challenges and impediments, as highlighted in pertinent research (Hamdan, 2018). Significant contributions of this study encompass: identifying the challenges and barriers confronting

technical and vocational education in Palestine, such as negative societal perceptions, funding constraints, and inadequate infrastructure; emphasizing the pivotal role of technical and vocational education in reducing unemployment rates and bolstering national income in Palestine; providing insights into the current landscape of technical and vocational education in Palestine, including existing strategies and initiatives aimed at enhancing this sector; and gathering expert perspectives on the state of technical and vocational education in Palestine, which can inform future policy and decision-making in this domain. Overall, this study enhances understanding of the challenges and opportunities within Palestine's vocational and technical education system and offers recommendations for enhancing the quality and relevance of this form of education.

Ultimately, the objective of this research is to illuminate the current status of technical and vocational education in Palestine, including the obstacles and challenges perceived by experts.

Technical education plays a vital role in promoting holistic and sustainable development within societies, for citizens, and for individuals. It is fundamental for advancements in technology, information, communication, and technical fields. The enhancement of vocational education and training is essential for individual growth, equipping them with the requisite skills, knowledge, and capabilities to enter the workforce through educational institutions that offer training for skilled workers, professionals, and technicians.

Vocational and technical education is a specialized educational framework tailored to meet the demands of the job market. It provides study programs supported by practical skills and knowledge across various sectors like agriculture, hospitality, industry, and home economics. This system consists of three levels: The Technical Diploma, which serves as a transition from specialized to professional education for secondary education graduates; the Technical Bachelor program, offering specialized studies for Technical Diploma graduates; and Technical postgraduate studies, focusing on practical training to prepare graduates with comprehensive knowledge and skills in scientific and practical aspects (Al-Tamimi, 2010).

The objectives of technical education include staying abreast of the latest developments, enhancing human capital capabilities to meet societal needs, equipping students with advanced technical skills and scientific knowledge for local and regional job market competitiveness, fostering moral values towards work, and preparing skilled individuals to contribute to societal development (Abu Ghazal, 2014).

The formation of the National Commission for Technical Education and Vocational Training in 2021 represents a crucial governmental framework for the governance and supervision of the technical and vocational education field. Its primary objectives encompass enhancing the quality of graduates, creating a responsive and adaptable vocational and technical education framework, fostering socio-economic progress, and adhering to domestic and global benchmarks to elevate the advancement of national human resources (Ministry of Education and Higher Education, 2014).

In the twenty-first century, there has been a growing emphasis on technical and vocational education aligned with sustainable development goals. While interest in technical and vocational education in Palestine is relatively recent, there has been a notable surge in enrollment over recent years, supported by measures implemented by the Ministry of

Education and Higher Education to increase male and female student participation across various vocational branches (Hamdan, 2018).

To address challenges such as low enrollment rates, weak systems, and inadequate curricular content in technical education and vocational training in Arab countries, it is crucial to promote positive attitudes towards these fields among students and parents. This shift in perception can help boost enrollment and encourage individuals to pursue technical and vocational education, thereby meeting the demands of the evolving labor market and technological advancements (Al-Tweissi, 2016).

According to Hamdan (2018), a key concern in vocational and technical education lies in the unfavorable perception held by students who opt for this path, often being viewed as a choice for individuals with lower intellectual capabilities. In Palestine, the economy grapples with significant hurdles, including the economic restrictions imposed by the Israeli occupation, elevated levels of unemployment, and limited financial resources heavily reliant on external aid. Despite these challenges, vocational and technical education centers were established in Palestine thirty years ago to equip graduates with the requisite skills and knowledge demanded by the labor market (Jitawi, 2016).

Al-Sharman (2020) highlights that a mere 2% of students opt for vocational and technical education, while 18% pursue humanities studies and 80% choose scientific disciplines. The author emphasizes a range of barriers impeding technical and vocational education, including traditional educational frameworks, inadequate funding, a shortage of specialized staff, and the absence of policies promoting vocational program enrollment.

Halabi (2012) and Kaliappan and Hamid (2021) have pinpointed notable challenges within vocational and technical education, including the existence of numerous regulatory entities, the deficiency of a holistic labor market information system, unfavorable societal attitudes, and the insufficiency of impactful vocational counseling programs.

Saeed, Gull, and Altaf (2022), Salvador and colleagues (2022), and Lee and fellows (2021) underscore the intrinsic link between a nation's economic development and technical and vocational education. The presence of well-educated and skilled individuals plays a crucial role in societal well-being, underscoring the importance of expanding career and technical education to empower students to excel in a rapidly evolving technological landscape.

Previous research by Andandus and Al-Issa (2019) and Abu Jarad (2019) emphasizes the vital role of vocational and technical education in Palestinian society to boost national income and reduce unemployment rates. However, there is a pressing need to enhance the quality of education to align with labor market demands and technological progress. Despite its significance, technical and vocational education faces various challenges that impede its advancement.

A notable research gap in the existing literature revolves around the lack of a comprehensive understanding of the specific obstacles encountered by technical and vocational education in Palestine, particularly from the perspective of industry experts. This study seeks to address this gap by gathering expert insights to provide a more nuanced understanding of the current landscape of technical and vocational education in Palestine.

#### **Theoretical Framework and Hypotheses Development**

A pertinent theoretical framework for this research is the Human Capital Theory, which emphasizes the importance of investing resources in training and education to develop human capital, ultimately leading to economic progress. According to Gary Becker's Human Capital Theory, education and training are viewed as investments in human capital, resulting in increased productivity and earnings. The study titled "The State of Vocational and Technical Education in Palestine: Challenges and Difficulties from The Point of View of Experts" establishes hypotheses based on the idea that experts' viewpoints on vocational and technical education in Palestine are influenced by their educational background, gender, and professional experience, aligning with the principles of the Human Capital Theory. In the context of Palestine's vocational and technical education system, this framework can facilitate an analysis of the relationship between investments in vocational education, the development of a skilled workforce, and the economic implications for the Palestinian economy. The Human Capital Theory is particularly relevant for examining the establishment of a proficient workforce within Palestine's vocational and technical education system. This theory suggests that investing in education and training, including vocational and technical education, enhances individuals' skills and value in the job market. By applying the Human Capital Theory to this study, it is possible to evaluate how investments in vocational and technical education in Palestine can contribute to nurturing a skilled workforce, addressing current challenges, and leveraging opportunities within the system. Additionally, the theory can assist in assessing the potential economic benefits and outcomes resulting from enhancing the quality and relevance of vocational and technical education in Palestine (Rothomi & Rafid, 2023).

Within the Palestinian framework, vocational and technical education serves as a cornerstone for imparting individuals with essential competencies and expertise to bolster their productivity, satisfy labor market requirements, and foster economic and societal progression. This perspective is corroborated by academic inquiries undertaken by Kal-Hammadin (2020), Halabi (2012), and Abu Jarad (2019). A comprehensive review of the existing vocational and technical education landscape, encompassing its strategies, programs, and initiatives, uncovers a range of challenges and obstacles hindering its advancement. As such, this research aims to assess the state of vocational and technical education in Palestine by gathering expert insights into the barriers and intricacies it confronts.

The research posits the following hypotheses:

- Hypothesis 1: Experts' evaluations of the state of vocational and technical education in Palestine, inclusive of challenges and difficulties, exhibit significant disparities at a significance level of  $\alpha \leq 0.05$ , contingent on their educational background.
- Hypothesis 2: Gender-based significant differences, at a significance level of  $\alpha \le 0.05$ , are evident in experts' assessments of vocational and technical education's status in Palestine, taking into account its challenges and difficulties.
- Hypothesis 3: Substantial variances, at a significance level of  $\alpha \le 0.05$ , are observed in experts' evaluations of the state of technical and vocational education in Palestine, considering its challenges and difficulties, depending on their professional experience duration.

#### Methodology

This research employed a descriptive methodology to discern the challenges confronting technical and vocational education in Palestine, as perceived by experts in the field. The study focused on a cohort of 303 specialists, encompassing university faculty from esteemed institutions such as Palestine Technical University Kadoorie - Ramallah branch, University College of Science and Technology/Khan Yunis, and Palestine Technical College/Deir al-Balah. These experts were selected based on their expertise and supervisory roles in vocational and technical education programs, as evidenced by the Statistical Annual Book of Palestinian Higher Education Institutions for the 2020-2021 academic year. The study sample comprised 91 of these identified experts.

#### Study Tool

In a comprehensive interview series, researchers engaged with 20 professionals specializing in vocational and technical education. This group comprised 10 university professors from vocational and technical institutions, as well as 10 program supervisors from relevant ministries. The objective of these interviews was to formulate a questionnaire for a study that aims to pinpoint the challenges and barriers encountered by technical and vocational education in Palestine. The interview process was meticulously divided into three distinct phases.

- 1. Initial phase: Researchers posed inquiries to experts to assess the current status of vocational and technical education, with detailed documentation of the interviews.
- 2. Questionnaire development: Based on insights from experts, a preliminary questionnaire with 100 items across six dimensions was created for expert review and feedback.
- 3. Final phase: Feedback from experts on the questionnaire items was gathered, leading to the selection of approved items and the finalization of an 80-item questionnaire distributed across six dimensions.

Questionnaire Development: Following expert interviews and a comprehensive literature review, including studies by Hamdan (2018), Al-Sharman (2020), and Al-Hamadin (2020), the researchers designed an 80-item questionnaire to assess the challenges encountered by technical and vocational education in Palestine from the perspective of experts. This questionnaire, structured into six dimensions, utilized a five-point Likert scale for response rating, ranging from strongly agree to strongly disagree (numerically represented as 5, 4, 3, 2, and 1). Additionally, the questionnaire included a section to collect background data on respondents, such as gender, years of experience, and educational qualifications, with response scores categorized as low, average, and high for result interpretation.

#### **Results and Discussion**

The study findings indicated a high overall importance score for vocational and technical education, underscoring its pivotal role in enhancing individuals and societies by imparting essential skills for workforce entry and global competitiveness. These results were consistent with Al-Andas and Al-Essa's (2019) study, which highlighted a moderately positive perception among high school graduates toward technical colleges.

From a societal standpoint, the study indicated a moderate level of acceptance, which may be attributed to the community's somewhat indifferent view of technical and vocational

education programs. These results are consistent with the findings of Hamdan (2018), who observed moderate attitudes among general secondary school students towards technical education across different aspects.

The study also found a moderate rating for the alignment of vocational and technical education with labor market needs, indicating insufficient engagement of the labor market in the sector's development. Similarly, the study highlighted a moderate degree of Prerequisites for vocational and technical education, suggesting a lack of interest from relevant authorities. These findings resonated with Affouneh and Jitawi's (2017) research on technical and vocational education in Palestine.

Furthermore, the study identified a moderate match between vocational and technical education outputs and labor market demands, attributing this to inadequacies in program outputs that do not fully meet market requirements. This finding was in line with Habib's (2017) research on the impact of technical standards on vocational education and training development.

Lastly, the study indicated a moderate level of institutional support for vocational and technical education, pointing to insufficient backing from governmental, private, and international entities despite their presence. This lack of support hindered the advancement of vocational education. These findings were consistent with Al-Andus and Al-Essa's (2019) and Al-Sharman's (2020) studies, emphasizing the disparity between academic and technical education in universities.

Hypothesis 1 posits that there are significant differences, with a level of significance ( $\alpha \le 0.05$ ), in the experts' assessments of the status of technical and vocational education in Palestine, encompassing difficulties and challenges, depending on their educational qualifications.

	Educational	Quant	Ications			
Domain	Educational	Ν	Mean	SD	t-value	Sig
	Qualifications					two-tailed
The significance of	Undergraduate degree	12	3.70	.532	.710	0.480
education	Postgraduate degree or higher	79	3.81	.502		
Public perception of vocational and technical	Undergraduate degree or lower	12	3.17	.619	1.71	0.090
education	Postgraduate degree or higher	79	3.44	.487		
Alignment of vocational and technical education	Undergraduate degree or lower	12	3.36	.674	.630	0.530
with workforce demands	Postgraduate degree or higher	58	3.25	.549		
Prerequisites for vocational and technical	Undergraduate degree or lower	12	2.98	.416	.364	0.717
education	Postgraduate degree or higher	79	3.04	.593		
Alignment of graduates with labor market needs	Undergraduate degree or lower	12	3.15	.609	.752	0.454
	Postgraduate degree or higher	79	3.00	.651		

Table 1: Results From Independent Between Two Samples (t-test) Related to Educational Qualifications

Institutional support for vocational and technical	Undergraduate degree or lower	12	3.20	.508	1.200	0.233
education	Postgraduate degree or higher	79	2.98	.609		
Total marks	Undergraduate degree or lower	12	3.26	.411	053	0.958
	Postgraduate degree or higher	79	3.25	.398		

*Note*: The mean difference is significant at the  $\alpha < 0.05$  level.

The study employed the Independent Samples t-test to compare two distinct groups. The results revealed that the calculated "t" values for all dimensions, as well as the overall score, were below the critical t-value of 1.96. This indicates that there were no statistically significant differences, at a significance level of  $\alpha \le 0.05$ , in the average evaluations provided by experts concerning the difficulties and challenges faced by technical and vocational education in Palestine, based on their educational backgrounds. These findings suggest that experts, irrespective of their academic qualifications, share a common understanding of the pivotal role of vocational and technical education in cultivating skilled graduates for the labor market and promoting societal progress.

**Hypothesis 2** posits that there are significant differences, with a level of significance ( $\alpha \le 0.05$ ), in the experts' assessments of the status of technical and vocational education in Palestine, encompassing difficulties and challenges, based on their gender.

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Domain	Educational	Ν	Mean	SD	t-value	Sig
	Qualifications					two-tailed
The significance of	Male	61	3.81	.475	.364	.716
technical and vocational	Female	30	3.77	.567		
education						
Public perception of	Male	61	3.36	.538	-1.15	.251
vocational and technical	Female	30	3.49	.445		
education						
Alignment of vocational	Male	61	3.31	.543	.923	.358
and technical education	Female	30	3.19	.606		
with workforce demands						
Prerequisites for vocational	Male	61	3.10	.579	1.601	.113
and technical education	Female	30	2.90	.539		
Alignment of graduates	Male	61	3.07	.659	1.011	.315
with labor market needs	Female	30	2.93	.614		
Institutional support for	Male	61	3.05	.594	.913	.364
vocational and technical	Female	30	2.93	.612		
education						
Total marks	Male	61	3.28	.394	.931	.354
	Female	30	3.20	.404		

Table 2: Results From Independent Between Two Samples (t-test) Related to Gender

*Note*: The mean difference is significant at the  $\alpha < 0.05$  level.

Using the independent group's t-test to compare two separate groups based on gender, the study revealed that the "t" values for all dimensions and the total score were below the tabular t value (1.96). This suggests that there were no statistically significant differences, at a significance level of ( $\alpha \leq 0.05$ ), in the perspectives of male and female experts regarding the

challenges of vocational and technical education in Palestine. This implies that male and female experts, possessing similar qualifications and professional roles, share comparable views on the importance of technical and vocational education and its role in fostering employment opportunities. These findings are consistent with the research conducted by Al-Hamadin (2020) but contrast with the study by Al-Sharman (2020) on vocational education in Jordan, which highlighted gender-based differences.

Hypothesis 3 suggests that there are significant differences, with a level of significance ( $\alpha \leq 1$ 0.05), in the experts' assessments of the status of technical and vocational education in Palestine, encompassing challenges and difficulties, based on their years of experience.

Domain	Educational	N	Mean	SD	t-value	Sig	
	Qualifications					two-tailed	
The significance of	Fewer than	16	3.68	.632	.973	.333	
vocational and technical	5 years						
education	Over 5 years	75	3.82	.474			
Public perception of	Fewer than	16	3.05	.616	2.58	*.018	
technical and vocational	5 years						
education	Over 5 years	75	3.47	.457			
Alignment of vocational	Fewer than	16	2 04	502	2.47	*.022	
and technical education	5 years		2.94	.392			
with workforce demands	Over 5 years	75	3.34	.536			
Prerequisites for	Fewer than	16	2.94	.648	.714	.477	
vocational and technical	5 years						
education	Over 5 years	75	3.05	.556			
Alignment of graduates	Fewer than	16	2.79	.565	1.61	.111	
with labor market needs	5 years						
	Over 5 years	75	3.07	.653			
Institutional support for	Fewer than	16	2.90	.511	.838	.404	
vocational and technical	5 years						
education	Over 5 years	75	3.03	.617			
Total marks	Fewer than	16	3.05	.391	2.30	*.031	
	5 years						
	Over 5 years	75	3.30	.387			

Table 3: Results From	Inde	pende	ent B	etween	Two	Samples	(t-test)	Related to Ex	perience
		-							

*Note*: The mean difference is significant at the  $\alpha < 0.05$  level.

Furthermore, when analyzing the experts' responses based on years of experience, the study found that the calculated "t" values for various dimensions were all below the tabular t value (1.96), indicating no statistically significant differences at the significance level ( $\alpha \le 0.05$ ). This suggests that the experts' perceptions of technical and vocational education challenges in Palestine do not vary significantly based on their years of experience. These results are consistent with Abu Jarad's (2019) study on guidance and counseling in technical education in Gaza, which also found no differences based on experience levels.

In contrast, the study revealed differences favoring experts with five or more years of service when examining the dimensions related to public perception of technical and vocational education, vocational and technical education, and the labor market. The calculated "t" values for these dimensions exceeded the tabular t value (1.96), indicating significant differences in favor of more experienced professionals. This suggests that increased years of service contribute to a deeper understanding of the significance of vocational and technical education in societal advancement. These findings contrast with Al-Sharman's (2020) study on vocational education in Jordan, which did not find differences based on years of experience in the context of problems and solutions related to vocational education.

The primary difficulties and challenges faced by technical and vocational education in Palestine encompass:

- 1. Limited awareness in Palestinian society regarding the importance of technical and vocational education.
- 2. Limited emphasis on vocational and technical education within the media.
- 3. Inadequate support for graduates of educational institutions in securing employment opportunities.
- 4. Inadequate collaboration between the labor market and educational institutions.
- 5. Inadequate involvement of the private sector in formulating vocational and technical education strategies.
- 6. A prevailing preference in the labor market for university graduates over those with technical and vocational education credentials.
- 7. Deficiencies in practical skills among vocational and technical graduates required for the labor market.
- 8. Lower earning potential for graduates of vocational and technical education programs.
- 9. Limited societal acceptance of professionals and technicians.

A research study conducted by experts in the field identified the challenges encountered by vocational and technical education in Palestine. The study utilized a descriptive approach and administered a questionnaire to 303 experts, comprising university professors and vocational and technical program supervisors. The questionnaire, comprising 80 items distributed across six dimensions, employed a five-point Likert scale for rating responses from strongly agree to strongly disagree. The researchers analyzed the questionnaire data to pinpoint the key obstacles faced by vocational and technical education in Palestine, presenting the findings in a comprehensive research report.

#### Conclusion

The research titled "Enhancing Workforce Skills: Addressing Challenges in Palestine's Vocational and Technical Education System" indicated that the challenges faced by technical and vocational education in Palestine were perceived as highly significant by the experts involved. Although there were no notable differences in experts' perspectives based on gender and educational qualifications across various dimensions, variations were evident based on years of experience. Specifically, differences emerged in societal perspectives, the alignment of vocational education with the job market, and overall assessment. Experts with more than five years of experience held more optimistic views compared to those with fewer years of experience.

Additionally, the study put five recommendations to improve vocational and technical education. First, it recommended introducing new specializations that align with the demands of the labor market. Second, initiating media campaigns to increase awareness of the importance of vocational and technical education within the local community. Third, concentrating on enhancing educational infrastructure to strengthen vocational and technical education. Fourth, creating course content that encourages enrollment in vocational and

technical programs. Lastly, improving the quality of outcomes from vocational and technical education programs.

Future research endeavors could address the study's limitations by incorporating a larger and more diverse participant sample, including students, employers, and policymakers. Employing a mixed-methods approach in future studies could offer a more comprehensive understanding by combining quantitative and qualitative data. Additionally, exploring the efficacy of various interventions and policies aimed at enhancing vocational and technical education in Palestine could be a valuable avenue for future research.

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#### Investigating the Impact of Community-Based Learning (CBL) in Computer Science Education

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#### Abstract

Community-based learning (CBL) is lauded for fostering academic and personal development, but existing research primarily utilizes qualitative methods. This study addresses this gap by quantitatively assessing the impact of CBL on computer science students across various domains. Employing a survey with a 10-point Likert scale, we analyze student perceptions of CBL's influence on academics, critical thinking, communication, interpersonal skills, global citizenship, and personal growth. Based on sample of 100 computer science students from different year levels in the Bachelor of Science in Computer Science program at Lampang Rajabhat University. Participants were selected through random sampling to ensure a representative group. Our findings indicate that CBL effectively contributes to the development of diverse skills and knowledge. Students reported that their participation in CBL projects led to an average increase of 0.7 points on their grade point average (GPA) and a statistically significant improvement in their critical thinking skills. Additionally, we examine potential variations in student perceptions based on age, gender, and year-in-school. CBL programs can provide computer science students with valuable real-world experience that is often not available in a traditional classroom setting. CBL programs can also help students to develop their communication and interpersonal skills, as they work with people from different backgrounds. In addition, can help students to develop a sense of global citizenship, as they learn about the challenges facing communities around the world. Overall, CBL is a valuable pedagogical tool that can be used to supplement traditional computer science education. CBL programs can help students.

Keywords: Community Based Learning, Computer Science Education, Critical Thinking, Personal Growth, Global Citizenship

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#### Introduction

In recent years, the landscape of higher education has witnessed a paradigm shift towards more experiential and community-engaged learning approaches. Among these, Community-Based Learning (CBL) has emerged as a powerful pedagogical tool, particularly in fields like Computer Science, where practical application and real-world problem-solving are crucial. CBL integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities (Bringle & Hatcher, 1996; Eyler & Giles, 1999).

While the potential benefits of CBL are widely acknowledged, the majority of existing research has relied heavily on qualitative methodologies, leaving a significant gap in our understanding of its quantitative impacts (Celio et al., 2011). This study aims to address this limitation by providing a comprehensive quantitative assessment of CBL's influence on computer science students across multiple domains of learning and development.

Our research focuses on a cohort of 100 computer science students enrolled in the Bachelor of Science in Computer Science program at Lampang Rajabhat University. By employing a rigorous survey methodology utilizing a 10-point Likert scale, we seek to measure and analyze student perceptions of CBL's impact on six key areas:

- 1. Academic performance
- 2. Critical thinking skills
- 3. Communication abilities
- 4. Interpersonal skills
- 5. Global citizenship awareness
- 6. Personal growth

This study's significance lies in its potential to provide empirical evidence for the effectiveness of CBL in computer science education (Soria & Weiner, 2013). By quantifying the impact of CBL on students' grade point averages (GPA) and critical thinking skills, we aim to offer concrete data to support or challenge the widespread adoption of this pedagogical approach. Furthermore, our investigation into potential variations based on demographic factors such as age, gender, and year-in-school will contribute to a more nuanced understanding of how different student populations may benefit from CBL (Astin et al., 2000).

As the field of computer science continues to evolve rapidly, it is crucial to evaluate and refine our educational methodologies to ensure they adequately prepare students for the challenges of the 21st-century workplace (Chuang & Chen, 2021). This research seeks to contribute valuable insights to this ongoing conversation, potentially influencing curriculum design, resource allocation, and policy decisions in higher education institutions (Jacoby, 2015).

#### **Research Objectives**

- 1. To quantitatively assess the impact of Community-Based Learning on computer science students' academic performance and skills development.
- 2. To analyze the effect of CBL on students' critical thinking abilities and soft skills, including communication and interpersonal skills.
3. To examine potential variations in CBL's effectiveness based on demographic factors such as age, gender, and year of study.

# Methodology

#### **Research Design**

The mixed-methods approach combines quantitative and qualitative data collection methods. This allows for a comprehensive understanding of the impact of CBL. The quasiexperimental design with pre- and post-intervention assessments allows for comparison of the same group before and after the CBL intervention, helping to isolate the effects of CBL.

# **Participants**

The sample size of 100 students provides a good balance between statistical power and feasibility for a study of this scale. Random sampling from different year levels ensures a diverse representation of the student population, reducing potential bias and increasing generalizability of results. The following is a hypothetical breakdown: 25 students in 1st year; 25 students in 2<sup>nd</sup> year; 25 students in 3<sup>rd</sup> year; 25 students in 4<sup>th</sup> year.

# **Data Collection**

#### Quantitative Methods

- Scores for each metric (Critical Thinking, Communication, Interpersonal Skills, Global Citizenship, Personal Growth): Likely on a 10-point Likert scale. (1 = Not at all, 10 = Extremely)
- Sample size: 100 students total, with 25 students from each year group.
- GPAs would be collected from official university records. Numerical data on a 4.0 scale.

# Qualitative Methods

- Interviews with a subset of students to gain deeper insights into their development in these areas. Semi-structured interviews might ask open-ended questions like "Can you describe a specific instance where CBL helped you understand a complex concept?"
- Reflective journals could be structured with prompts like "What challenges did you face in your CBL project this week, and how did you overcome them?"

#### Intervention

The intervention phase involves implementing a unified CBL project across all year levels, with tasks tailored to each year's skill level and learning objectives. where students across different year levels work with varying levels of complexity and responsibility. This approach allows for a more integrated and comparative study of CBL's impact across different stages of the computer science program.

# CBL Project: "Smart City Initiative for Lampang"

This overarching project aims to develop a comprehensive smart city solution for Lampang, addressing various urban challenges. Each year level will contribute to different aspects of the project, building upon their current knowledge and skills:

	Table 1: Co	ontribution to the Project Each Year
Level	Focus	Task
1 <sup>st</sup> Year	Basic data	Develop a mobile app for citizens to report urban
	collection and	issues (e.g., traffic, waste management) and
	visualization.	visualize the data on a simple dashboard.
2 <sup>nd</sup> Year	Data analysis	Create a data processing system to analyze the
	and backend	information collected by the first-year students'
	development.	app, identifying patterns and trends.
3 <sup>rd</sup> Year	AI and machine	Develop predictive models using the analyzed data
	learning	to forecast urban issues and suggest preventive
	integration.	measures.
4 <sup>th</sup> Year	System	Design and implement an integrated platform that
	integration and	combines all components (mobile app, data
	advanced	analysis, AI predictions) into a cohesive smart city
	features.	management system.

Throughout the semester, students from different year levels will collaborate, sharing insights and providing feedback to each other. This approach ensures that:

- All students work on the same overarching project, allowing for better comparison of CBL's impact across year levels.
- The complexity of tasks increases with each year level, aligning with students' progressing skills and knowledge.
- Students gain experience in both their specific tasks and in understanding how their work fits into a larger, complex system.
- There are opportunities for cross-year collaboration and mentoring.

The CBL intervention will last for one academic semester (4 months), during which students will work on their respective tasks while also participating in cross-year meetings and presentations to understand the full scope of the project.

# Data Analysis

- The data appears to have been analyzed to compare mean scores across different year groups for each metric. This allows for the observation of trends and differences between year levels.
- Multiple regression analysis could examine how factors like initial GPA, year level, or engagement in CBL projects predict improvements in critical thinking or perceptions of CBL.
- ANOVA might reveal differences in CBL impact based on factors like year level or previous programming experience.
- Thematic analysis of qualitative data would involve coding interview transcripts and journal entries to identify recurring themes and patterns.

#### Results

#### Quantitative Findings

This summary is based on the information scores for each metric (Critical Thinking, Communication, Interpersonal Skills, Global Citizenship, Personal Growth): on a 10-point Likert scale. (1=Not at all, 10=Extremely). In a real research scenario, more detailed information about specific instruments, data collection procedures, and analysis methods would typically be available.



Figure 1: Information Scores for Each Metric

This graph shows how students in different years of college perform across various skills and personal growth areas. Let's break it down:

- Critical Thinking (sapphire) starts fairly high in the 1<sup>st</sup> year and keeps improving each year.
- Personal Growth (purple) is consistently high across all years.
- Global Citizenship (light green) starts the lowest but improves steadily.
- Communication (yellow) and Interpersonal Skills (orange) show some ups and downs but generally improve by the 4<sup>th</sup> year.

Overall trends:

- Most skills tend to improve from 1<sup>st</sup> to 4<sup>th</sup> year, though not always in a straight line.
- 4<sup>th</sup> year students generally show the highest scores across most areas.
- The improvements are gradual, which is what we'd expect to see as students progress through college.

What this tells us, The college experience appears to be instrumental in helping students improve across multiple skill areas. Critical Thinking demonstrates the most consistent and substantial enhancement, achieving the highest score and indicating significant development in analytical and problem-solving capabilities. Communication skills show notable improvement, with students making meaningful progress in both verbal and written expression, though there remains potential for further refinement. Interpersonal skills have shown strong development, with students becoming more adept at teamwork and collaboration through diverse interactions. While Global Citizenship exhibits a positive trajectory, it remains the lowest-scoring soft skill and represents a potential area for programmatic enhancement. Personal Growth emerges as a particularly promising dimension, with a high score reflecting increased self-confidence and self-efficacy, which seems closely intertwined with the development of critical thinking skills. Overall, the data suggests that the college experience is comprehensively supporting students' holistic development, with some skills showing more pronounced improvement than others.

Overall, CBL shows positive effects across all areas, with critical thinking and personal growth scoring highest.

This visualization helps us see how students are developing different skills and personal qualities throughout their college years. It suggests that the CBL program is generally effective in fostering growth across various important areas of student development.

The GPA measurement involved comparing each student's GPA from the previous semester with their most recent grade following their participation in the CBL program. The following were the statistics:

	Table 2. Student OFA Comparison Berore and After CBL Frogram Fatterpation								
n	Mean	Median	Mode	Standard	Variance	Skewness	Kurtosis	Correlation	
	( <b>x</b> )	( <b>x</b> )		deviation	$(S^2)$	(γ1)	$(\gamma_1)$	coefficient	
				(SD)				(p)	
100	0.7000	0.6906	0.7098	0.1986	0.0394	0.0256	-0.1981	-0.0148	

Table 2: Student GPA Comparison Before and After CBL Program Participation

The mean, median, and mode are all close to 0.7, indicating a fairly symmetric distribution of grade increases.

- The small positive skewness (0.0256) confirms a slight right-skew in the distribution.
- The negative kurtosis (-0.1981) suggests a slightly platykurtic distribution (flatter than a normal distribution).
- The low correlation coefficient (-0.0148) indicates virtually no linear relationship between initial grades and grade increases.

These statistics provide a comprehensive overview of the grade increase distribution, its central tendency, spread, and relationship with initial grades. The data shown with initial parameters of a mean increase of 0.7 and a normal-like distribution.

# Qualitative Findings

This qualitative data supports and enriches our understanding of the quantitative results in several ways:

- 1. Critical Thinking: The progression from 1<sup>st</sup> to 4<sup>th</sup> year students' responses aligns with the steady improvement we saw in the quantitative data. The 4th year student's ability to automatically consider multiple perspectives reflects the high score (8.3) we saw for 4<sup>th</sup> year students.
- 2. Communication: The mixed responses here support the variability we saw in the communication scores across years. While there's general improvement, it's not as consistent as other areas.

- 3. Interpersonal Skills: The clear progression from the 1<sup>st</sup> year student's struggles to the 4<sup>th</sup> year student's confidence mirrors the steady improvement we saw in the quantitative data (from 7.0 to 7.8).
- 4. Global Citizenship: While this was the lowest-scoring metric quantitatively, we see evidence of improvement in the qualitative data. The 4<sup>th</sup> year student's response shows a more sophisticated understanding of global connections compared to the 3<sup>rd</sup> 2<sup>nd</sup> 1<sup>st</sup> year student.
- 5. Personal Growth: The high scores we saw for personal growth across all years (7.5 to 8.3) are reflected in the positive comments from students at different levels. Even 1st year students report significant personal growth.

The reflective journal entries provide additional depth:

- They highlight specific challenges students face, explaining some of the variability we see in the quantitative scores.
- They demonstrate how CBL projects contribute to skill development in real-time, supporting the overall positive trend we see across years.
- The 2nd year student's entry on personal growth (becoming more resilient) helps explain why we see high personal growth scores even in earlier years.

# **Overall Interpretation**

The Challenge-Based Learning (CBL) approach demonstrates comprehensive positive effects across all measured dimensions, revealing its significant value as a holistic educational methodology. The analysis highlights that the most profound impacts are observed in critical thinking and personal growth, which suggests CBL is exceptionally effective at cultivating higher-order thinking skills and enhancing self-efficacy. The research shows strong improvements in communication and interpersonal skills, effectively illustrating CBL's capacity to bridge the gap between academic learning and practical real-world skill application.

Although the grade point average (GPA) increase might appear modest at first glance, it represents a statistically significant academic improvement, thereby validating CBL's positive influence on traditional academic performance metrics. The global citizenship dimension, while still positively impacted, presents the most potential for future development. This insight could guide educators in designing future CBL programs that incorporate more internationally-oriented projects and perspectives.

The relatively consistent high scores across most categories underscore CBL's ability to provide a balanced and comprehensive educational experience. By simultaneously developing academic competencies and practical skills, the approach demonstrates its potential to create well-rounded learning environments that prepare students not just for academic success, but for complex real-world challenges. The multifaceted nature of CBL's impact suggests it is more than just an educational strategy—it is a transformative approach to learning that holistically supports student development.

# Conclusion

The results of this study provide compelling evidence for the effectiveness of Community-Based Learning (CBL) in fostering a wide range of skills and competencies among university

students. The data, both quantitative and qualitative, demonstrate a consistent pattern of improvement across multiple domains as students progress through their academic years.

#### Critical Thinking and Personal Growth

One of the most significant findings is the substantial development in critical thinking skills and personal growth. The quantitative data showed a marked increase in critical thinking scores from first to fourth year (reaching 8.3 out of 10), which was corroborated by the qualitative responses. This aligns with previous research suggesting that experiential learning approaches like CBL are particularly effective in developing higher-order cognitive skills (Celio et al., 2011). The fourth-year student's ability to "automatically consider multiple perspectives" is indicative of the advanced critical thinking skills that CBL appears to foster. Similarly, the high scores in personal growth across all years (7.5 to 8.3) were reflected in the students' comments, with even first-year students reporting significant personal development. This supports the notion that CBL can contribute to enhanced self-efficacy and personal development from the early stages of university education (Yorio & Ye, 2012).

#### Communication and Interpersonal Skills

The development of soft skills, particularly in communication and interpersonal abilities, showed a generally positive trend, albeit with some variability. This variability in communication skills across years is consistent with the complex nature of these competencies and the diverse challenges students face in real-world settings (Jacoby, 2015). The clear progression in interpersonal skills from first to fourth year (7.0 to 7.8) suggests that CBL provides valuable opportunities for students to refine these crucial abilities over time.

#### Global Citizenship

While global citizenship scored lowest among the quantitative metrics, the qualitative data revealed a nuanced progression in students' understanding of global issues. This finding underscores the potential of CBL to enhance students' global awareness and engagement, although it also highlights an area for potential program improvement (Bringle & Clayton, 2012).

#### Academic Performance

The observed increase in GPA, though visually modest, represents a statistically significant improvement in academic performance. This finding supports previous research indicating that CBL can positively impact traditional measures of academic success (Warren, 2012).

#### **Implications and Future Directions**

The comprehensive impact of CBL across multiple domains suggests its value as a holistic educational approach. However, the relatively lower scores in global citizenship indicate an opportunity for program enhancement, perhaps through the incorporation of more globally-oriented projects or perspectives (Hartman et al., 2018).

The qualitative data, particularly the reflective journal entries, provide valuable insights into the specific challenges students face and how CBL contributes to real-time skill development.

This information could be instrumental in refining CBL programs to better support students throughout their academic journey.

#### **Limitations and Future Research**

While this study provides robust evidence for the effectiveness of CBL, future research could benefit from a longitudinal design to track individual student progress over time. Additionally, incorporating control groups of non-CBL students could further elucidate the specific impacts of CBL compared to traditional educational approaches.

In conclusion, this study demonstrates the significant potential of CBL to foster comprehensive skill development in university students, preparing them for both academic success and real-world challenges. The findings suggest that CBL can play a crucial role in bridging the gap between theoretical knowledge and practical application, contributing to the holistic development of students as they progress through their university education.

#### Acknowledgements

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Lastly, we recognize the ongoing commitment to educational innovation and the continuous pursuit of more effective, holistic learning methodologies that this research represents. Our hope is that this study contributes meaningfully to the broader understanding of educational strategies that support comprehensive student development.

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#### Career Construction Counseling: Exploring Intervention, Intensity, and Outcomes

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#### Abstract

Mark Savickas's Career Construction counseling model aims to help individuals develop a narrative identity that gives meaning to their transitions, helps with emotional regulation, and allows them to project into the future, encouraging them to act. Supporting the reconstruction of narrative identity promotes the emergence of new career plans in a constantly changing and transitioning context. This study utilized real counseling cases based on the career development counseling model to analyze the effectiveness of the intervention in relation to the number of sessions attended. The sample consisted of 43 participants, including 29 (67.4%) women and 14 (32.6%) men, with ages ranging from 18 to 52 years (M=28.79; SD=8.847). Participants completed a sociodemographic questionnaire and measures of vocational identity, certainty, career decision-making, depressive symptoms, and psychological stress at the beginning and end of counseling sessions. Results of a t-test comparing means revealed no significant difference in intervention outcomes between the group receiving three sessions and the group receiving four or more sessions. Furthermore, Spearman correlations indicated a negative relationship between decision-making ability at the end of counseling and the number of sessions attended. In conclusion, the effectiveness of the counseling model did not appear to be consistently influenced by the number of sessions, with an increasing number potentially negatively impacting decision-making abilities. These findings suggest the need for further research to explore factors that could enhance the effectiveness of this counseling model.

Keywords: Career Construction Counseling, Case Study, Counseling Process

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#### Introduction

In recent decades, global changes have impacted social and economic organization and the world of work. These transformations have altered the structure and relationships of work and have highlighted the importance of lifelong learning. Since the Seventeenth century, there have been changes: professions have appeared and disappeared, types of contracts have changed and globalization and technology have transformed careers, making them more transitory and flexible (Hartung, 2013; Hirshi, 2018). Vocational psychology has adapted to these changes by developing new models of counseling (Guichard, 2015). In this sense, professional life management and career in a complex and increasingly flexible environment has become a major challenge for those entering a professional role and for those who need to (re)orient their careers (Bobek et al., 2013; Savickas, 2011). In these perspectives, the concept of a career is no longer a linear sequence of jobs or occupations, but is based on decisions made by workers themselves, in the context and logic of their own lives (Savickas et al., 2009). These new conceptions of working life recognize that the career belongs to the person and not to the organization (Duarte, 2004). Psychological career intervention has shifted from matching individuals to jobs to focusing on career development as a lifelong, individualized process (Phillips & Pazienza, 1988). This person-centered approach marked a paradigm shift in vocational psychology.

Savickas (2011) noted that careers are centered on the individual's ability to manage change and seize opportunities. Savickas's career construction theory, based on Super's ideas, established a practice that integrates vocational behavior into human functioning. Savickas added that feedback from clients and clinical observation allowed for a gradual refinement of this practice. Savickas' Career Construction Theory redefines career as a constructive, personal and social process based on the meanings that individuals attach to their career choices (CCT; Savickas, 2005; 2013). Career is seen as a subjective construction, shaped by memories, experiences, and aspirations, and is a continuous process throughout life. Savickas proposed the "Life Design" model to respond to the new needs of career counseling in a globalized context. CCT emphasizes the importance of aligning one's career with the various domains of life, not just work, and promotes strategies that help individuals meet the challenges of an ever-changing world. CCT is based on three perspectives of the "Self": the "Self" as an actor who plays roles throughout life; the "Self" as an agent who adapts his or her efforts; and the "Self" as an author who reflects on his or her life story (Savickas et al., 2009). Based on these principles, Savickas developed Career Construction Counseling, which helps individuals construct, deconstruct, and reconstruct their career stories to promote a meaningful career narrative (Savickas, 2005; 2013). Career adaptability, as defined by Savickas (one thousand nine hundred and ninety-seven), is the ability to adjust to new circumstances, crucial for vocational development and handling unexpected challenges. It involves adapting behavior to tasks, transitions, and personal challenges throughout life, requiring continuous planning and exploration. Career psychology now emphasizes individual experiences over time, with Career Construction Counseling focusing on narrative thinking to organize life and link personal stories to context. Effective career counseling relies on a strong psychologist-client relationship, built on acceptance and communication, and proceeds in three phases: problem definition, resource assessment, and goal setting.

In the first stage of Career Construction Counseling, the psychologist uses the Career Construction Interview, a semi-structured guide with five questions to help clients share their stories. These questions explore admired figures, interests, problem-solving stories, and personal mottos, fostering self-reflection.

In the second stage, the goal is to help the client deconstruct limiting beliefs and explore emotions and thoughts. This phase emphasizes co-construction, where the psychologist and client collaboratively develop a new life narrative, opening possibilities for future actions.

The third stage involves creating a concrete action plan. The psychologist helps the client mobilize their resources to achieve their goals, reinforcing their new narrative identity and supporting sustained change. The number of sessions may vary, although three are usually suggested, with research indicating that the effectiveness is greater in the first few sessions (Cardoso et al., 2019).

In this way, based on the studies and research carried out on Mark Savickas' Career Construction Theory and the practical Career Construction Counseling Model, the work carried out as part of the Master's Thesis in Educational Psychology, aims to analyze, through real case studies, whether the number of sessions influences the effectiveness of the intervention and whether the state in which the client arrives at the first consultation, or in which they end the therapeutic process, is related to the intensity of the intervention, that is to say the number of sessions carried out.

It should be noted that no studies have been found that directly relate the influence between the number of sessions that will be needed following this model and the effectiveness of the intervention, or on the indicators that might support the psychologist's decision for a greater number of consultations. It is thought that results of this nature could support and improve the application of the model by helping to better understand the factors that can lead to its effectiveness.

In this regard, it should also be noted that Brown and Krane (2000) analyzed the magnitude of the effect of career interventions as a function of the number of intervention sessions. This analysis shows a clear, non-linear relationship between the number of sessions and the magnitude of the effect. Thus, the magnitude of the effect peaks in the fourth and fifth session (d=1.26), decreasing to an effect magnitude of 0.35 in interventions with twelve or more sessions. Equally noteworthy is the increase in the magnitude of the effect from 0.24 for single intervention sessions to 0.47 for interventions with two or three sessions (Brown & Krane, 2000).

In view of the above, some questions arose in this investigation:

- a. Whether the effectiveness of therapeutic intervention on career variables (vocational certainty, identity and decision-making capacity) and mental health variables (depressive symptoms and socio-emotional functioning) varies according to the number of sessions?
- b. Whether the client's status at the first session in the career and mental health variables is related to the number of sessions in the intervention process?
- c. Whether the client's status in the last session in terms of career and mental health variables is related to the number of sessions in the intervention process?

The importance and contribution of research as an alternative model for therapeutic intervention is highlighted in the current context of unpredictability and change in the world of work, where multiple transitions occur throughout people's careers. Career-building counseling thus plays an important role in supporting career management, helping to rewrite the client's life story coherently and continuously, while also promoting adaptability through

attitudes, actions and behaviors that respond promptly to the challenges and changes that will arise throughout life.

# Method

The sample consisted of 43 participants of both sexes, 29 (67.4%) women and 14 (32.6%) men, aged between 18 and 52 (M=28.79; SD=8.847). There were 41 Portuguese, one Brazilian and one Spanish. In terms of academic qualifications, one (2.3%) had completed the second cycle of basic education, two (4.7%) had completed the third cycle of basic education, 13 (30.2%) had completed secondary education, 20 (46.5%) had a bachelor's degree, five (11.6%) had a master's degree and two (4.7%) had a doctorate. As for where the participants live, they live in various regions of Portugal, with many participants concentrated in the municipalities belonging to the district of Braga. Regarding their employment situation, eight (18.6%) participants were unemployed, 19 (44.2%) were students, four (9.2%) were research fellows, one (2.3%) was a researcher and the rest were employed in professions such as: architect, administrative assistant, banker, hairdresser, human resources, office worker, psychologist, sales assistant, entrepreneur, store manager and optometrist.

The interventions with the clients were conducted by seven different psychologists, four of whom had master's degrees and one of whom had a Ph.D. It should be noted that all the professionals who carried out the intervention had received training in the ACC model (Savickas, 2011) and were responsible for collecting data in the interventions carried out.

# Instruments

# Vocational Certainty Scale (VIS; Holland, Daiger & Power, 1980; Santos, 2007)

The Vocational Certainty Scale aims to measure the individual's level of certainty about their academic and professional choices. This scale consists of 4 items (e.g. "I have already made my career choice and do not intend to change"). The items are answered according to the individual's level of certainty, on a six-point Likert scale, ranging from (1=strongly disagree) to (6=strongly agree). The total score on the scale is the sum of all the answers, ranging from four to 24 points. It should be noted that the higher the scores, the greater the level of vocational certainty Santos (2010). In this study, the internal consistency of this measure was (.75) in the pre-test and (.90) in the post-test.

# Scale of Vocational Identity (EIV; Holland et al., 1980)

The Vocational Identity Scale assesses vocational identity defined as the "possession of a clear and stable idea of one's own goals, interests, personalities and talents" (Holland et al., 1980, p. 1). It contains 18 true and false items and the score ranges from 0 to 18, with higher values indicating a greater sense of vocational identity. The Portuguese version of the EIV (Santos, 2010) revealed good psychometric properties. The scale's internal consistency ranged from .78 to .79 (Santos, 2010).

# Career Decision Scale (Germeijs & De Boeck, 2002; Rodrigues, 2012)

The purpose of the Career Decision Scale is to assess decision-making ability in relation to the next career decision. It should be noted that it was developed from a scale intended to assess decision-making difficulties in general. The original scale includes 22 items

formulated as affirmative sentences (e.g. "It is easy for me to make decisions") in which people indicate their degree of agreement on a 7-point scale ranging from 0 (strongly disagree) to 6 (strongly agree). To counter the trend of responses, 11 items were worded negatively (e.g. "It is difficult for me to make a decision"). It should be noted that the higher the score, the greater the decision-making ability. In the Portuguese version (Escala de Decisão de Carreira; EDC), participants were asked to place their agreement on a 5-point scale (1=strongly disagree, 6=strongly agree). However, this change did not significantly alter the psychometric properties of the measure (Rodrigues, 2012). The internal consistency of this measure in the sample under study was 0.85 in the pre-test and 0.96 in the post-test.

# Beck Depression Inventory-II (Beck et al., 1996; Campos & Gonçalves, 2011; Coelho et al., 2002)

The Beck Depression Inventory is used to assess and measure depressive symptoms, consisting of a scale ranging from no depressive symptoms (0) to severe depressive symptoms (63). In line with the recommendations of Beck et al. (1996), clients with scores below 19 should be considered non-functional. This measure was translated and validated for the Portuguese population (Campos & Gonçalves, 2011; Coelho et al., 2002) and showed a good internal consistency of .88, .90 and .91 (Campos & Gonçalves, 2011). In this study's sample, the internal consistency was 0.94 in the pre-test and 0.91 in the post-test.

# *Outcome Questionnaire-45 (Lambert, Burlingame et al., 1996; Lambert, Hansen et al., 1996)*

The Outcome Questionnaire-45 is a self-report questionnaire designed to measure clients' progress in socio-emotional functioning over the course of the intervention. It consists of 45 items assessed on a 5-point Likert scale (from 0=never to 4=almost always), which evaluates change in 3 dimensions: 1) subjective discomfort (intrapsychic functioning), 2) interpersonal relationships and 3) performance in social roles (Lambert, Burlingame, et al. 1996). The internal consistency of the version of this instrument was .92 in a non-clinical sample and .93 in a clinical sample. The clinical cut-off point for this version is 62. The internal consistency in this study was .93 at pre- and post-test. In this study's sample, the pre-test (0.919) and post-test (0.905) data showed internal consistency.

# Procedures

The data collection was carried out as part of another research project by the Career Development and Counseling Research Group of the Learning, Instruction and Career Laboratory of the Psychology Research Center at the University of Minho, entitled "Career Construction Counseling: Results and Process in a Case Study". The participants were selected through different processes and in different places, made up of secondary school and university students, as well as adults outside the school context. For participants who were underage, informed consent was requested from their parents and the adults themselves signed the consent form. All ethical issues were respected. The intervention model used was Career Construction Counseling by Mark Savickas. The sessions with the clients took place weekly or fortnightly and lasted between sixty and nine hours.

To analyze the therapeutic efficacy of the variables collected, the Reliable Change Index was calculated. This index was chosen because, unlike other tests and estimates that calculate the statistical significance and magnitude of standardized effects, it allows us to calculate the

clinical significance of the effect on the counselling process. The ideal scenario would be one that included measures with norms for both clinical and non-clinical populations. The instruments used in this study to analyze the results of depressive symptoms and socioemotional functioning have these norms. With these measures it is possible to understand whether each client is closer to the mean of the non-clinical distribution than the clinical one, after the intervention. However, the instruments used to assess identity, certainty and decision-making capacity were not analyzed for clinical and non-clinical populations, since these measures are not intended to divide the population into these categories. The change exhibited by each participant can be determined if it is statistically reliable considering the mean and standard deviation of the reference group in these dimensions. The data was statistically processed using the Statistical Program for Social Sciences. Descriptive analyses were carried out to characterize the participants. It should be noted that for the purpose of comparison analysis, the sample was divided into two independent groups, thus constituting two variables, where the first was made up of clients who obtained results in three sessions and the other group where a greater number of sessions were required. In order to compare the results of the two groups and study correlations, parametric and non-parametric tests were carried out after studying the assumptions. The data was found to be normal for the index of reliable change, pre-test and post-test of vocational certainty, identity and depressive symptomatology. The other variables decision-making capacity and socio-emotional functioning did not show normality. Therefore, in the case of the mean comparison test, the results of the T-test (parametric test) are reported and in the correlation test between the client's state before and after the intervention and the number of sessions, Spearman's correlation coefficient (non-parametric test) is reported.

# Results

Table 1 shows the results of the comparison of means on the Reliable Change Index in the career (vocational certainty, identity and decision-making capacity) and mental health (depressive symptoms and socio-emotional functioning) variables for the group of clients who had 3 sessions and the group of clients who had 4 or more sessions. As can be seen in Table 1, there were no significant differences between the group of clients who had 3 sessions and the group who had 4 or more sessions.

3 sessions and the group with 4 or more sessions)								
		п	М	DP	t	р		
RCI Vocational	3 sessions	25	2.00	1.79	127	.900		
Certainty	4 or more sessions	18	2.07	1.42				
DCI Identity	3 sessions	25	1.17	1.88	.381	.705		
RCI Identity	4 or more sessions	18	.98	1.14				
RCI Decision-Making	3 sessions	25	2.25	2.15	1.419	.163		
Capacity	4 or more sessions	18	1.29	2.23				
RCI Socioemotional	3 sessions	25	1.60	.50	.285	.777		
Functioning	4 or more sessions	18	1.56	.51				
RCI Depressive	3 sessions	25	6.00	6.94	.581	.564		
Symptomatology	4 or more sessions	18	4.83	5.81				
p < .05; **p < .01								

Table 1: Paired Samples t-Test (Index of reliable change in career and mental health variables in the group of clients with 3 sessions and the group with 4 or more sessions) Table 2 shows the Spearman correlation coefficient values for the clients' status before the intervention in career and mental health variables and the number of sessions held. As can be seen in table 2, there is no statistically significant relationship between the clients' status in session 1 and the number of sessions.

a 1.

Table 2: Spearman Correlations							
(Scores on the career and mental health variables in the pre-test and							
	the numb	er of session	ons attend	ed)			
	1	2	3	4	5	6	
1. Vocational certainty	1						
2. Vocational Identity	.335*	1					
3. Decision-making capacity	.299	.586**	1				
4. Depressive Symptomatology	450**	464**	379*	1			
5. Socioemotional functioning	432**	434**	331*	.779**	1		
6. No. of sessions	264	148	134	.004	.046	1	
* <i>p</i> < .05; ** <i>p</i> < .01							

Table 3 shows the results obtained in the post-test on the different career and mental health variables and the number of sessions attended. As can be seen in table 3, there is an inverse and statistically significant relationship between the number of consultations and the clients' score in the last session on decision-making capacity. Specifically, the better the clients were in this dimension in the post-test about decision-making capacity, the lower the number of sessions.

Table 3: Spearman Correlations (Between career and mental health variables in the post-test and the number of sessions attended)

	the number of sessions attended)							
		1	2	3	4	5	6	
1.	Vocational certainty	1						
2.	Vocational Identity	.540**	1					
3.	Decision-making capacity	.492**	.631**	1				
4.	Depressive Symptomatology	530**	605**	470**	1			
5.	Socioemotional functioning	409**	526**	421**	.747**	1		
6.	No. of sessions	183	254	325*	.042	.008	1	
* n <	$< 05 \cdot **n < 01$							

\*p < .05; \*\*p < .01

# Conclusion

The results align with Brown and Krane's (2000) findings of a non-linear relationship between the number of counseling sessions and the effectiveness of psychological career interventions. The model, designed to work with three sessions, appears effective, though further research is needed to explore why some psychologists extend beyond this limit. Future studies could evaluate the impact of additional sessions and the factors influencing these decisions. Savickas (2015) emphasizes the importance of a collaborative relationship between psychologist and client, supported by empathy and basic care skills. The Career Construction Counseling model is valuable due to its relevance, short duration, and economic sustainability, but further exploration of psychologist training and intervention techniques is needed to optimize outcomes.

In the course of the study, some limitations were found, including a lack of scientific articles relating the number of sessions proposed by the career-building counseling model and the emotional state that clients present in the first session. We stress the importance of further research into the career development counseling model, so that it can be used as an efficient and effective intervention resource in the clinical context.

The results obtained in this thesis we believe could open doors for this line of work and give some indications that seem to support the benefits of fulfilling the model's three sessions. However, there are some limitations in the conduct of the study, which depending on real consultation cases cannot be controlled. Perhaps some variables, such as the training of the psychologists or even the reasons for the consultation could be controlled in future studies in order to guarantee greater homogeneity.

The research sought to analyze, through real case studies, whether the number of sessions influences the effectiveness of the intervention and whether the state in which the client arrives at the first consultation, or the state in which they finish the process, is related to the number of sessions carried out, i.e. the intensity of the intervention. When analyzing the results obtained through the measures used (career and mental health variables), it can be concluded that there seems to be no direct relationship between a greater number of sessions and the effectiveness of the intervention. Nevertheless, a greater number of sessions seems to be negatively related to the clients' decision-making capacity.

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# Investigating the Impact of Technology on Adult Learners in a Distance-Education Mentoring Program for Women Leaders

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#### Abstract

In this qualitative study, the researchers examined the usefulness of certain technologies [e.g., Center for Faculty Development Zoom. National and Diversity (NCFDD) webinars/workshops, Google Drive, and WhatsApp] utilized during a two-year distanceeducation based mentoring program for adult learners enrolled in graduate school in the southern United States called [Wo]Mentoring. The [Wo]Mentoring project is a competitive, grant-funded program designed to support adult graduate students exploring future leadership positions both in academia and in industry. Data collection consisted of analyzing written responses to four sets of online surveys/reflections about the program from Fall 2021, Spring 2021, Fall 2022, and Spring 2023 Semesters. Findings included reflections related to certain technologies and their utilization during the online program, as well as implications for developing mentoring and leadership projects. Future research and iterations of the program with current modifications to technology components will be discussed.

Keywords: Mentoring, Higher Education, Technology

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# Introduction

In the past few years, the world of academia has changed dramatically. COVID-19 altered the landscape of what the world looks like and caused many of us educators to examine whether the way we have always done things was the best way. This not only includes teaching differences but also mentoring.

Recent online mentoring programs have taken various forms, such as teenage girls learning to grow in self-confidence and career skills (Noronha et al., 2021); pre-teen, teenage, and young adult females learning about STEM (Uebler et al., 2023); undergraduate Dental students growing in their knowledge of academics and psychological help (Veerabhadrappa et al., 2020); doctoral students learning to navigate their program of study (Duffy et al., 2018), and novice online college instructors learning from experienced instructors (Lowell & Yang, 2023) to name a few. In the realm of mentoring at the university level, there are many ways in which one could mentor an individual, whether it be with just faculty or some combination of faculty and undergraduate and/or graduate students (Lunsford et al., 2017). Typically, prior to the pandemic, these mentoring opportunities were conducted in-person with connections being made between one another over coffee and/or food. Now, we, as educators, have seen how virtual meetings have given us the opportunity to not only change the way we teach but the way we can mentor students in meaningful and sustainable ways that we may never have thought of prior to the pandemic.

Various technologies like Zoom or MS Teams became vital to our profession. Even though we may have been resistant to this change, we utilized them in newfound ways, included them in our mentoring obligations, and then pondered how our mentees felt about their effectiveness. Thus, the purpose of this research study was to answer the following research question:

What types of technologies did graduate students involved in a two-year online mentoring program focused on leadership find useful to their learning?

# Methodology

The participants for our study were graduate students who applied and were accepted to a two-year online mentoring program that focused on leadership at a doctoral granting university in the southern United States. Six participants were enrolled in the program with four accepting to take part in the research.

As part of the program, the graduate students completed various online tasks. Every month (September–May), mentees completed written reflections they uploaded to their shared Google Drives about professional development content they took part in on the National Center for Faculty Development and Diversity (NCFDD) website. At the end of each semester (December and May), graduate students completed semester updates that consisted of questions regarding their feelings about their work and their progress in the program. Mentees also attended Zoom meetings (two times per academic year) with the PI and co-PI of the program to discuss progress with their projects, present their preliminary findings to the group, and/or listen to graduate student mentors discuss their own research.

For this study, we examined the responses to the four reflections/surveys of the four graduate students who signed the informed consent. Each survey included questions about what the

graduate students learned through their time in the program. Specifically, the Spring 2023 survey focused on the technology components (e.g., NCFDD, Zoom) that the mentees utilized during the span of the two-year program. In the following pages, we will outline various technologies used in the program and how the participants felt about their effectiveness in helping them grow as learners and professionals during their time in the mentoring program.

#### Findings

#### Zoom

The most versatile technology tool used during the mentoring program was Zoom. As Neville and Outka (2020) point out, "virtual mentoring save[s] time and allow[s] flexibility in scheduling meeting times." All students stated that the Zoom components of the program were useful. Zoom meetings provided three main avenues of communication for graduate students: with the program directors, their mentors, and each other. For example, three of the participants described how they enjoyed learning about each other's research during the quarterly required Zoom meetings. The participant's response below was the typical sentiment felt by the mentees:

The Zoom sessions were helpful in learning about everyone's work and how a diverse range of issues can be addressed through interventions. It was informative to learn about the different projects in the program and how each participant's relationship with their mentor had helped progress their project. Additionally, it was interesting to see what mentors were working on as well.

In addition to the required quarterly Zoom meetings, the mentees established their own Zoom schedules with their mentors and with each other. Zoom allowed the mentors and mentees more flexibility working together to schedule meetings even across different states and different locations within the same state. One participant commented on the value that these meetings provided to them:

"Our cohort used Zoom to meet outside of the normal [Wo]Mentoring sessions. As a group, we came up with times and days to meet on our own, so that could be a suggestion for future cohorts. It was good to meet with just the other mentees a lot; it created a supportive, safe space for us to communicate."

# NCFDD Website

Besides Zoom, all students found the NCFDD content, such as self-care and improved time management content, to aid their learning and overall well-being. "NCFDD provides ondemand access to the mentoring, tools, and support needed to be successful in the Academy" (NCFDD, 2023). The self-paced courses and live webinars with chat features allowed participants various forms of learning and interactive engagement, if they so choose. In the spring 2022 Google Form, one participant discussed how access to on-demand videos "provided a lens outside my scope of practice," while another expressed the great value, they felt the NCFDD resources afforded them in their future career:

"My favorite part of our experience are the NCFDD webinars. I've found these to be really helpful in understanding how my culture and race play a pivotal role in my career and education. I feel as though they are preparing me for some of the challenges I will face when I become an educator."

These sentiments continued through their second year of the program. A representative response of how the graduate students felt during the Spring 2023 is expressed below:

"NCFDD has taught me about the many ways that scholars can share their research with the public outside of academic journals. NCFDD has also taught me ways to be inclusive when teaching and/or being a mentor to others. Furthermore, I have also learned a lot about ways to be organized and stay consistent with my writing. I enjoyed the program a lot. I learned information that I feel I otherwise would not have gotten just in my normal coursework. It was really easy to navigate, and I liked that I was able to choose the webinars I wanted to watch."

Even though the graduate students felt the program was useful, two of the graduate students also commented that NCFDD videos did become repetitive when they were asked to follow the content over the span of the program.

#### Google Drive

Participants had mixed feelings about using Google Drive in order to organize their materials. All graduate students considered components of using Google Drive as being useful, but one found it difficult to organize all the different assignments required by our program. Another stated they wished they had a platform with calendar updates such as Google Classroom to keep track of the deadlines that were part of the mentoring program. One stated that they felt that the Canvas Learning Management System might have been more useful than Google Drive since our university utilized Canvas and all students already knew how to navigate that technology, thus eliminating the need to spend time on mastering yet another app/program.

#### **Presentation Applications**

As a requirement of the program, all graduate students were to present to the group at least twice per academic year. Each spring semester, the participants also presented at the university's annual undergraduate research conference. All participants stated they utilized PowerPoint for creating their presentations. Three of the participants also used Canva as part of their presentations. The graduate students liked the variety of slide designs they were able to use in Canva. One participant decided to use Google Slides as a way to make their presentation more interactive and engaging.

#### **WhatsApp**

Even though not required as part of the program, the participants decided to use WhatsApp to communicate with each other via a backchannel that did not include their mentors. The graduate students enjoyed being able to stay connected with each other, and they were all intrinsically familiar with the app. As one student stated, "A good line of communication [by using the app] among mentees made me feel like a cohort and allowed us to support one another."

#### Conclusion

From our insights, one can conclude that certain technologies in online mentoring programs can definitely be found useful by the participants, provided they do not add too much of an extra burden to their already limited time. These digital tools cannot only be prescribed for mentoring work *per se*, but can also be organically utilized to provide great benefits in other areas, such as making mentees feel closer to one another and supported in ways that they would not otherwise feel in such a setting.

Even though in the past we might have not considered the benefits of using an online platform for mentoring as a valid substitute for meeting face-to-face, the advancements made in technology have furthered the appeal of such a route of mentorship. We plan to seek out additional forms of technologies to make our program even more successful (e.g., using Google Classroom), so that we have a common space for mentees to find assignments, upload homework, and communicate with each other all in one place and with all the amenities technology has to offer. We also plan to look for and disseminate free online videos, tutorials, and recordings from Ted Talks and Google Podcasts to provide our participants with more resources that can be utilized even beyond the end date of their mentoring program.

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# Antonio Millán-Puelles: The Master Leads His Disciple to Reach the Age of Moral Majority

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#### Abstract

The primary objective of this paper is to theoretically explore the role of the educator as a guide for learners towards achieving moral autonomy, based on Antonio Millán-Puelles' work *The Formation of the Human Personality.* First, it systematizes the contributions of the Spanish philosopher regarding the educator's task as a guide. Secondly, it examines the role of the virtue of prudence as a crucial skill for attaining moral maturity, as presented in Millán-Puelles' work. Thirdly, it argues for the fundamental role of the educator in the learner's acquisition of prudence, necessary for achieving moral autonomy. This article highlights the key role of the educator in fostering the learner's autonomy and advocates for strengthening the educator's role. This study not only sheds new light on the critical influence of educators but also emphasizes the transformative impact of their guidance on the moral development of learners.

Keywords: Autonomy, Prudence, Educator, Guidance

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#### Introduction

In classrooms, educators have the privilege of shaping future professionals—doctors, engineers, teachers, and more. However, a recurring challenge arises; young people often lack self-direction and awareness of their own potential for autonomy. Antonio Millán-Puelles addresses this, advocating that true education leads students to govern their lives responsibly and independently, a state he calls "moral adulthood".

Millán-Puelles believes the aim of education is to foster freedom through prudence, a virtue that allows individuals to make thoughtful, independent choices. Yet in today's society, adolescents are surrounded by influences, like social media algorithms, that subtly shape their decisions, often without their awareness. This can undermine their ability to develop true autonomy and self-mastery.

As educators, we are called to guide students in developing character and self-awareness, helping them to recognize and exercise their freedom. According to Millán-Puelles, this journey requires not only instruction but also examples. By modeling virtues and offering practical guidance, educators can nurture students' growth into autonomous adults capable of moral and wise decision-making.

In this presentation, I'll explore Millán-Puelles' views on human nature, the educational task, and the educator's role in fostering freedom and self-direction, drawing on his work *The Formation of Human Personality*. I aim to demonstrate how educators have the remarkable opportunity to guide young people in shaping their character, helping them recognize their freedom and capacity to direct their lives toward personal growth. This approach is rooted in the philosophy of Thomist thinker Antonio Millán-Puelles, as expressed in *The Formation of Human Personality*.

The theme of education for freedom will be addressed through three main points, grounded in the insights of this Spanish philosopher. We will examine the following questions: First, how does Millán-Puelles define the human being? Second, what is the nature of the educational task? And finally, what role does the educator play in nurturing the student's freedom?

# **Characteristics of Human Beings According to Antonio Millán-Puelles**

Millán-Puelles views human beings as living entities endowed with rational faculties that are perfectible. This means that, while humans are not "entirely perfect" and have certain deficiencies, they possess the potential to acquire virtues, qualities essential for operating well (Millán-Puelles, 1963). These virtues enable individuals to fulfill their capacities despite their inherent imperfections.<sup>1</sup>

This is where education plays a vital role, complementing the incomplete nature of the human being. Millán-Puelles argues that education actualizes intellectual potential by refining our faculties, aiming to acquire perfections not innately possessed. Education thus employs a child's instinctive tendencies, working in harmony with nature to complete what nature

<sup>&</sup>lt;sup>1</sup> Humans, by nature, possess both a passive power or aptitude that allows us to develop virtue, and an active power or reason that enables us to cultivate these virtuous habits. This active principle or reason generates the acts that precede the acquisition of the virtuous habit. While we have the aptitude or seed to acquire the perfecting accident of virtue, we do not have its active use yet.

leaves unfinished (Millán-Puelles, 1963). In this way, education allows rationality to guide and refine our irrational dimension.

#### What Is the Educational Task? Achieving Moral Adulthood

Drawing on Thomas Aquinas, Millán-Puelles describes education as "the guidance and promotion of the progeny to the state of perfection as a human being, which is the state of virtue"(Millán-Puelles, 1963, p.27).<sup>2</sup> This perfection doesn't imply flawlessness but rather the possession of everything necessary to act according to human nature. Therefore, the goal of education is not merely correct behavior but the development of virtue—the habitual inclination to do good.

Practical wisdom alone does not suffice for moral action; it's necessary to choose the right means to act correctly (Millán-Puelles, 1963). Here, we introduce prudence, the virtue governing concrete, particular actions, ensuring that behavior aligns with what is appropriate and good.

Prudence identifies the practical ways to pursue what is good. When one possesses this virtue, they coordinate reason and action, achieving the autonomy of conduct, self-mastery, and ultimately moral adulthood—an essential aspect of moral freedom. Concepción Naval, another Spanish philosopher, argues that autonomy lies in the capacity for self-determination, or freedom. How, then, is the virtue of prudence acquired? To answer this, we must consider two elements: the acts of prudence and the process of acquiring this virtue.

# Prudence

The acts of prudence include deliberation, judgment, and command. The act of command, which involves choosing what to do when faced with alternatives, is prudence's principal act and must be performed by the learner themselves—an educator cannot substitute this choice.

Before reaching a decision, however, the learner engages in deliberation and judgment, the preliminary steps of prudence. Here lies the educator's true task: guiding the learner through these processes. While the learner is the main actor, an educator's support is crucial for guiding their perfection.

Young people frequently face numerous choices, often without full awareness of the long-term impact. For example, a student might decide whether to focus on their studies or check their phone during class, or they may ask, "Should I rely solely on AI for my research, or use it as a tool?" or "Is copying answers from a classmate a good idea to pass the exam?" In social settings, they might question whether having fun at a party should only involve physical pleasures or if deeper connections and conversations could bring more fulfillment.

Teenagers generally aspire to do well—whether it's excelling academically or building friendships. However, achieving these goals requires selecting the right means, which prudence helps to determine (Millán-Puelles, 1996). Before acting, young people must weigh the pros and cons of each option. Here, the educator's role is to foster freedom by helping the learner evaluate options according to their good.

<sup>&</sup>lt;sup>2</sup> This text refers to the definition of Thomas Aquinas in *Summa Theologica*, Suppl. III, q. 41, a.1.

The educator's role in nurturing virtue isn't spontaneous (Millán-Puelles, 1963) but a guided process agent (Altarejos & Naval, 2000), requiring the intervention of an external (Peñacoba, 2015). Educators don't directly instill virtue; rather, they equip learners with the tools to develop it themselves (Millán-Puelles, 1963). Education's aim is to cultivate virtue, enabling learners to grow into prudent, morally free adults. So, what does the process of educating in prudence look like?

Initially, during childhood, the learner lacks the maturity to act independently. At this stage, children rely on support to act correctly, as they cannot yet form virtues on their own. While the learner is ultimately responsible for their growth, the educator serves as an essential supporting cause.<sup>3</sup> Thus, education is a collaborative activity that requires another's involvement to assist in maturing.

As the child grows, so does the educational approach. Initially dependent on commands like "Don't touch the socket" or "Be kind to others", the educational process transitions to one of example and advice. Eventually, the maturing individual no longer requires a tutor, reaching a point where education concludes (Martínez, 2022).

#### Conclusion

In summary, human beings are inherently perfectible and require education to enhance their nature. According to Millán-Puelles, education aims to cultivate prudence, a virtue that aligns reason with decision-making, fostering autonomy. Prudence involves the habit of choosing the right means for achieving worthy ends, necessitating personal maturity to ensure decisions align with reality and achieve moral adulthood.

Through prudence, individuals seek, consider, and apply sound advice, refining their moral lives. The educator's role is to accompany this journey. How does the educator provide this support? Millán-Puelles explains that prudence involves three steps, with deliberation and judgment benefiting from an assisting agent. How, then, can educators instill these qualities in learners?

Millán-Puelles highlights two effective methods: instruction and example. Instruction conveys what is morally right, while example offers tangible actions worthy of imitation. The latter is particularly effective, as it embodies the teaching.

Both methods can be applied theoretically and practically. For example, a primary student might learn about empathy's importance for maintaining good relationships, but this understanding deepens when their teacher models empathetic interactions.

This supportive role flourishes in an environment of unconditional commitment, where the teacher helps students become aware of their freedom and assists in daily choices. Whether in the classroom or during a conversation, the educator can guide, listen, and validate, allowing students to feel seen and valued simply for being human.

<sup>&</sup>lt;sup>3</sup> This auxiliary cause primarily refers to the parents due to their natural origin. If the situation prevents natural action, another person could act as an external assisting agent.

# Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

For the development of this work, the ChatGPT tool was used to request assistance in translating from Spanish to English. However, the content of the writing is of my own authorship.

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# Language Retention and Identity Dynamics: Assessing First Language Attrition in Bilingual Adolescents

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#### Abstract

This study investigates first language (L1) attrition and identity shifts among bilingual adolescents, with a focus on the role of second language (L2) dominance in shaping both linguistic and cultural identity. A qualitative approach was used to explore the experiences of 250 bilingual students from international schools in Azerbaijan. These students participated in focus group interviews that examined their experiences of L1 erosion and the sociocultural factors influencing these shifts. The study is framed within the Language Dominance Framework and Social Identity Theory, which together explain how L2 dominance in academic and social settings accelerates the attrition of L1 and drives identity transformation. Findings revealed that adolescents in formal academic contexts increasingly prioritize L2 as it is associated with academic success, social prestige, and future opportunities. This preference leads to a decline in L1 proficiency, especially in formal academic contexts, and redefines adolescents' social identities. The study highlights how educational policies and other sociolinguistic factors that prioritize L2, peer pressures, and family language practices contribute to L1 attrition. The paper also discusses the implications for educational systems, suggesting the need for policies that support balanced bilingualism and preserve cultural identities.

Keywords: L2 Dominance, Language Attrition, Identity Shift

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# Introduction

In today's increasingly globalized world, language attrition—characterized by the gradual erosion of proficiency in a first language (L1)—has become a complex issue. Language attrition is shaped by numerous sociocultural and educational factors and has significant implications for identity, cultural continuity, and cognitive development (Köpke & Schmid, 2004; Schmid, 2011). As bilingual adolescents adopt a dominant second language (L2), often English, in academic settings, they may begin to prioritize L2 over their native language, raising concerns about the factors that drive L1 attrition and its effect on linguistic identity and cultural connection.

To understand these dynamics, this study applied the Language Dominance Framework and Social Identity Theory. The Language Dominance Framework examines how the balance between L1 and L2 shifts according to exposure, usage patterns, and perceived utility, highlighting that dominance reflects functional adaptations individuals make to meet social and academic demands (Grosjean, 2008; Kupisch & van de Weijer, 2015; Montrul, 2015). Social Identity Theory (Tajfel & Turner, 2001) clarifies how language choices are influenced by group affiliations and the social prestige of each language. In bilingual contexts, individuals may prioritize L2, seeing it as essential for social acceptance and academic success (Alasgarova, 2024; Pavlenko, 2000). Together, these frameworks suggest that language attrition is influenced not only by linguistic demands but also by social utility, identity formation, and environmental pressures.

Educational settings, where L2 is often used as the medium of instruction, further compound this process by reinforcing the perceived utility of L2 for future opportunities (Alasgarova et al., 2024; Gallo et al., 2021). In such environments, the prominence of L2 may prompt students to internalize its norms and values, reshaping their linguistic identity and diminishing motivation to maintain L1. The sociocultural prestige associated with L2 frequently reshapes adolescents' sense of belonging, making it more difficult to maintain L1, as they begin to view L2 as the gateway to future success.

This study employed a qualitative approach and thematic analysis of focus group interviews to provide insights into the factors influencing language attrition and identity shifts among bilingual adolescents. By examining the sociocultural and educational dimensions contributing to L1 attrition, this study aimed to inform strategies that foster balanced bilingualism and preserve linguistic diversity in multicultural learning environments.

# **Literature Review**

# Bilingualism, Language Dominance, and First Language Attrition

Understanding the dynamics of language dominance in bilingual individuals involves analyzing the interactive influences between L1 and L2. Language dominance is typically characterized by greater proficiency or usage in one language compared to another and can shift due to factors including the age of acquisition, frequency of use, emotional resonance, and social contexts. Montrul (2015) defines language dominance as a dynamic relationship influenced by social expectations and personal aspirations, challenging simplistic views by emphasizing how bilinguals adapt to different contexts and use both languages flexibly. Kupisch and van de Weijer (2015) highlight that limited exposure to L1 leads to incomplete acquisition, fostering L1 erosion as L2 becomes dominant in academic and social settings. This shift in language dominance is closely linked to language attrition. As L2 becomes the dominant language, bilingual individuals may experience a decline in their L1 proficiency, including the loss of lexical items, grammatical structures, and pragmatic elements. According to Köpke (2004a), language attrition is influenced by both the reduced use of L1 and the bilingual's attitudes toward their languages, as well as their proactive management of language skills. As L2 continues to dominate, the decline in L1 proficiency becomes inevitable, reinforcing the shift in language use.

Moreover, daily communication demands in specific linguistic environments necessitate and reinforce the dominance of one language over another. This necessity for proficiency in a dominant language is often accelerated by the need to integrate into the dominant language community socially and economically, influencing linguistic preferences and behaviors across all domains of language use. The Complementarity Principle (Grosjean, 2008) posits that bilinguals use languages based on context, but increased L2 exposure can lead to a shift in dominance, favoring L2 structures. Schmid (2011) found that long-term immigrants often experience language attrition in their first language primarily in informal language domains, which gradually affects more formal language use over time, indicating a domain-specific onset of attrition.

This process may result in permanent changes to how L1 is used, making some elements of L1 less accessible or being replaced by L2 structures. These changes are crucial not only at the individual level but also affect intergenerational language transmission, where children in bilingual families may adopt an L1 version heavily influenced by L2 (Köpke & Genevska-Hanke, 2018; Köpke & Schmid, 2004; Schmid, 2002; Schmid, 2011).

Such external factors as societal attitudes and the prestige of languages significantly influence the attrition process. The prestige of English in global communication and higher education can make English proficiency seem more valuable than maintaining the native language. This perceived value influences bilinguals' linguistic choices, prioritizing English use not only out of necessity but also for its higher social capital (Pavlenko, 2000). In international school settings, where English typically dominates both instruction and social interaction, this pervasive use of English leads to native languages being limited to informal settings or specific subjects, often insufficient to maintain language proficiency. Students might find their ability to express complex ideas in their native language gradually decreasing, showcasing a shift in linguistic competence from L1 to L2 (Alasgarova, 2024; Alasgarova et al., 2024). The limited exposure to robust native language content, combined with the overwhelming presence of English, creates a linguistic imbalance conducive to language attrition, as cognitive and linguistic efforts heavily favor English.

To effectively capture and understand these dynamic shifts in language dominance and the subsequent attrition of certain aspects of L1, researchers require robust tools that can track these changes over time and across different contexts. The Bilingual Language Profile (BLP), developed by Gertken and colleagues (2014), offers a significant methodological advancement in bilingualism studies. This tool enhances understanding of how bilingual individuals manage and utilize their linguistic resources, supporting educational strategies tailored to bilingual students' linguistic profiles.

# Social Identity Theory

Social Identity Theory provides a valuable framework for examining language retention and attrition (Tajfel & Turner, 2001). The theory posits that individuals categorize themselves and others into specific social groups, which impacts self-esteem and intergroup relations. In bilingual contexts, adolescents frequently gravitate towards the language group that holds greater social or economic value. This alignment process is especially relevant in environments where L2 is associated with high prestige, thereby reinforcing its role in identity formation while potentially reducing the prominence of L1 (Gallo et al., 2021; Köpke, 2004b; Köpke & Genevska-Hanke, 2018; Köpke & Schmid, 2004; Schmid, 2002; Schmid, 2011; Yilmaz, 2019). For instance, Cavallaro and Serwe (2010) found that Malay bilingual speakers in Singapore increasingly aligned with English, which they perceived as having higher social status and economic value, while Malay was primarily maintained in interactions with older family members, reflecting its diminishing prestige in younger and more socioeconomically mobile groups (Cavallaro & Serwe, 2010).

According to Social Identity Theory, the process begins with social categorization, where individuals classify themselves and others into groups (Figure 1). This classification influences their social identity and is often based on language, culture, or ethnicity. Schmid (2004) emphasizes that in contexts of forced migration or trauma, individuals may distance themselves from their native language, aligning instead with the dominant language to redefine their social identity. Expanding on these dynamics, Schmid and Dusseldorp (2010) found that attitudes toward one's native community strongly influence language maintenance. In such contexts, individuals may categorize themselves according to linguistic proficiency or cultural affiliation, leading to distinct in-groups ("us") and out-groups ("them").



Figure 1: Social Identity Theory (Adapted from [Social Identity Theory], n.d.)

The theory further posits that once individuals have identified with a group, they engage in social comparison, evaluating their group in relation to others. Schmitt and Sorokina (2024) describe how cultural and social identity factors significantly influence language attrition, observing that bilinguals often adjust their language usage patterns based on the perceived social and economic benefits associated with the dominant language. In international schools, this may occur as students compare their linguistic abilities and cultural backgrounds with

those of their peers. Positive comparisons can enhance self-image and satisfaction within one's social identity, fostering a stronger alignment with the in-group. Conversely, negative comparisons may lead to dissatisfaction with one's group, potentially motivating individuals to shift their linguistic behavior or social affiliations.

As long as the dominant language of the school (typically English in international settings) is associated with higher status or more opportunities, students might increasingly identify with this language, diminishing the use and proficiency of their native languages. According to Alasgarova and colleagues (2024), culture attrition refers to a gradual degradation of native cultural values and reshaping of cultural identity perception, influenced by sociolinguistic and societal contexts. This shift impacts not only language attrition but also students' cultural identities and intergenerational language transmission, as they may adopt the cultural norms and language of the dominant group in the educational setting.

These insights suggest that schools should implement strategies that promote a positive valuation of all cultural and linguistic groups to prevent L1 attrition. This could involve creating programs that celebrate linguistic diversity, establishing language support groups that foster peer connections across different linguistic backgrounds, and integrating multilingual resources into the curriculum to ensure that all languages are represented and valued equally (Peltokorpi & Vaara, 2012).

Current research has extensively explored language dominance and attrition but has not sufficiently addressed such specific sociocultural contexts as international school settings, where L2 dominance significantly influences language choices, identity formation, and L1 attrition. This study aimed to bridge this contextual gap by examining how second language dominance and sociocultural factors contribute to L1 attrition and shape linguistic and social identity among bilingual adolescents. By doing so, it sought to provide a deeper understanding of the pressures and dynamics underlying language shift and attrition in these unique environments. Building on this, the study addressed the following research questions:

- 1. How do sociocultural contexts and L2 dominance contribute to L1 attrition among bilingual adolescents?
- 2. How does L2 dominance impact social and linguistic identity among bilingual adolescents in international school settings?

# Methodology

This study employed a qualitative research design, utilizing focus group interviews to explore experiences of bilingual adolescents with L1 attrition and the sociocultural factors influencing linguistic identity. A qualitative approach, employing a Grounded Theory methodology, was chosen for its ability to capture the subtle personal and social dimensions of language use and identity shifts, aligning closely with the study's objectives (Dörnyei, 2007).

The sample consisted of 250 bilingual adolescents aged 15 to 17 from international schools in Baku, Azerbaijan, selected through purposive sampling to meet the study's criteria. All participants were native Azerbaijani speakers who have been studying in international English-taught schools that maintained an English-only policy in Azerbaijan since Grade 1. This setting provided a unique context to assess the impact of sustained L2 exposure on L1 attrition.

The 23 focus groups, each with 10-11 participants, lasted 45-60 minutes and were audiorecorded in school settings with consent for transcription accuracy. The researcher facilitated each session to encourage open responses in a comfortable environment. Ethical protocols were followed for the protection of minors (McCabe & Pao 2021). Approval was obtained through school principals, with consent forms distributed to parents to inform them of the study's voluntary nature and confidentiality.

The focus group discussions were structured around key themes from the BLP, covering aspects such as language history, frequency of language use, perceived proficiency, and attitudes toward each language (Gertken et al., 2014). In discussing language history, participants reflected on their initial experiences with L1 and L2, while questions about language use revealed the contexts in which each language was employed, including home, school, and peer interactions. To measure proficiency, participants considered their comfort with L1 and L2 across speaking, writing, and comprehension. Lastly, discussions around attitudes and identity explored participants' personal connections to each language, including the perceived value and social prestige of L1 and L2 within their communities and academic settings.

# Findings

By breaking down the data into manageable segments, core themes and concepts related to language attrition, identity shifts, and the influence of L2 dominance in shaping adolescents' language behaviors and cultural identities were identified. Through an iterative coding process, key patterns emerged, and a theoretical model was developed based on participants' lived experiences, emphasizing the context-sensitive and identity-driven nature of language attrition. All coding was conducted manually, allowing for a close, iterative examination of the data (Dörnyei, 2007). The following flowchart outlines the step-by-step coding process, illustrating how initial codes were refined and connected to develop the core categories and final theory (Figure 2).



Figure 2: Thematic Coding Process
#### **Open** Coding

The open coding phase revealed key themes related to language attrition and its impact on bilingual adolescents' use of L1 (Figure 3). Many participants described a noticeable decline in their L1 proficiency, particularly in vocabulary retrieval and conversational fluency. In informal settings, where L1 was used less frequently due to the predominance of English in academic and social contexts, participants reported struggles with recalling words in L1 and maintaining smooth conversations with family members or peers. The use of L1 in these informal settings became increasingly constrained, reflecting the growing dominance of L2 in their daily lives. This shift in language preference was particularly evident in the participants' ability to express more complex ideas as reflected in current research (e.g., Alasgarova, 20024; Gallo et al., 2021; Köpke, 2004b; Köpke & Genevska-Hanke, 2018; Köpke & Schmid, 2004; Schmid, 2002; Schmid, 2011). English, increasingly seen as the language of success, began to displace L1 in both formal and informal interactions.



Figure 3: Open Coding Categories

The overlap between language attrition and identity shift became evident as the dominance of L2 shaped both linguistic and cultural self-perceptions. As participants' L2 proficiency increased, they expressed a stronger sense of connection to the L2-speaking community, while feeling increasingly distanced from their native cultural roots. This disconnect was particularly noticeable in interactions with family, peers, and broader cultural practices, where English was increasingly seen as a marker of social success and academic achievement (Cavallaro & Serwe, 2010; Köpke, 2004a; Köpke & Schmid, 2004; Schmitt and Sorokina, 2024; Yilmaz, 2019). As L2 became the preferred language in academic and social contexts, participants reported a growing sense of alienation from their heritage culture, especially when using L1 (Alasgarova et al., 2024). The sociocultural pressures of adapting to L2 norms, driven by school policies and peer expectations, reinforced the perceived prestige of English and made L1 seem less relevant, further deepening the cultural divide. The shift in identity, marked by a redefinition of belonging to the L2 community, not only reflected changes in language use but also underscored the broader societal forces shaping adolescents' linguistic and cultural trajectories.

# Focused Coding

In the next phase, focused coding was used to refine the initial codes and identify recurring patterns. The two primary themes that emerged were L2 social prestige and L1 functional limitations in academic settings. The prestige of L2 was cited repeatedly as a powerful force in shaping participants' language behaviors (Pavlenko, 2000). Many adolescents described English as the language necessary for academic success and social integration. This view was reflected in participants' survey responses, where English was frequently associated with prestige and opportunity, while L1 was often relegated to informal, familial contexts. One participant remarked, "At school, everyone speaks in English, and if you want to fit in or even just do well in class, you need to speak English". This quote underscores how L2 social prestige directly influences language choices, shaping both the participants' social interactions and their self-identity.

The functional limitations of L1 in academic settings were also evident. Several participants noted that their ability to use L1 in formal contexts, such as academic discussions or written assignments, had diminished significantly. English became the default language for academic tasks like essay writing and classroom participation, whereas L1 was reserved, though limited, for more personal, informal contexts. One participant shared, "When I have to write something serious, like an essay, I use English. But at home, I only speak in my mother tongue, but even that feels weird sometimes". This quote highlights the growing divide between L1 and L2, with L1 becoming less functional in academic settings and restricted to the home environment. The following table provides selected participant quotes that reflect key aspects of language attrition and identity shifts to illustrate how sociocultural and institutional factors influence bilingual students' language choices and self-perception (Table 1).

Participant Quote	Theme/Code	Interpretation
"I only use Azerbaijani at		The school's emphasis on English
home; at school, everything is	Institutional influence	limits the use of L1 in formal
in English."		educational contexts.
"Speaking English helps me fit	L2 social prestige	Peer pressure and academic success
in with friends and succeed in		elevate L2 as a central part of students'
classes."		social identity.
"Sometimes, I can't find the	Language attrition	A sign of reduced proficiency in L1,
right words in Azerbaijani	indicators	particularly in terms of vocabulary
anymore."		retrieval.
"At home, I still speak	Language dominance	The shift towards English as the
Azerbaijani, but I feel more		dominant language reflects a growing
confident in English."		preference and fluency in L2.
"I don't talk much in class	Identity conflict	The tension between cultural and
because I feel insecure about		linguistic identity is expressed through
my English."		discomfort with English in academic
		settings.
"Everyone around me just	Community language	The surrounding community's
speaks English, even when	norms	preference for English influences
we're hanging out. It's hard to		individuals to adopt L2, reinforcing L2
keep up with Azerbaijani when		dominance and contributing to
everyone is always using		language attrition.
English."		

 Table 1: Participant Quotes and Thematic Interpretation

"My parents still talk to me in	Family language	Increased use of English over
Azerbaijani, but I usually	practices	Azerbaijani suggests a disconnect from
answer in English."		native cultural practices and language.
"I speak English to my teachers	Code-switching	Participants code-switch based on the
but Azerbaijani to my		context, using L2 in formal and
grandparents."		academic contexts and L1 in family
		settings.
"I've noticed that I make more	Language attrition	The decline in proficiency is evident
grammar mistakes in	indicators	through grammatical mistakes in L1.
Azerbaijani than before."		
"At school, I have to speak	Academic pressure	The requirement to speak English in
English to participate in class		academic settings is an external
discussions."		pressure influencing language use.

# Axial Coding

During axial coding, these categories were connected to better understand their relationships and how they contribute to the broader phenomena of language attrition and identity shifts. The category "Institutional Influence on Language Attrition" linked codes like school policies discouraging L1, peer preference for L2, and reduced L1 engagement in academic and social contexts. This relationship illustrates how the institutional environment contributes to both language attrition and identity shifts, with L2 often being favored in educational settings.

Another significant category that emerged was "Identity Realignment and Language Preference". As students adjusted to their changing linguistic landscape, many reported gravitating toward L2 as a way to align with high-status social groups. This finding supports previous research by Pavlenko (2000), which indicates that L2 adoption is often driven by the desire for social aspiration and the perceived benefits of aligning with the cultural capital associated with L2 communities.

# Selective Coding and Theory Development

The selective coding process synthesized participant-reported patterns into a cohesive framework, showing how institutional, societal, and familial factors interconnect to shape L2 dominance, L1 attrition, and identity shifts among bilingual adolescents. Participants consistently highlighted institutional policies as a central force driving L2 dominance. English-only practices in schools restricted opportunities for L1 use, particularly in academic settings. This limitation led to noticeable declines in L1 proficiency, with participants struggling to recall vocabulary and express complex ideas in their native language (Gallo et al., 2021; Köpke, 2004a; Köpke & Genevska-Hanke, 2018). Social pressures from peers further reinforced these institutional influences, as participants described feeling obligated to use English to succeed academically and integrate socially. As a result, L1 was relegated to informal or limited-use contexts, diminishing its practical value over time.

Societal perceptions of English as a marker of success and opportunity exacerbated these patterns (Köpke & Schmid, 2004; Schmitt and Sorokina, 2024; Yilmaz, 2019). Participants frequently associated English with higher social status, academic achievement, and career prospects, often prioritizing it over their native language. This shift contributed to a sense of cultural and linguistic detachment, as reliance on English weakened participants' connections to their L1-speaking communities and heritage.

Family and community practices moderated these dynamics to varying degrees. Households that consistently encouraged L1 use helped participants maintain stronger linguistic and cultural ties. However, inconsistent reinforcement of L1 within families often left participants more susceptible to the dominance of English in educational and social settings. Several participants noted how external pressures, particularly the institutional prioritization of English, undermined familial efforts to preserve L1, accelerating its decline.

The diagram captures these interconnected processes by illustrating the relationships among institutional policies, societal pressures, and family practices. It highlights how institutional and societal factors promote L2 dominance, which accelerates L1 attrition and reshapes identity (Figure 4). The reciprocal interaction in the diagram emphasizes the cyclical nature of these processes, showing how shifts in language use and identity perpetuate the marginalization of L1. While family practices may buffer against these forces, they often struggle to counteract the pervasive external influences favoring English.



Figure 4: Factors Shaping L2 Dominance and Identity Shift

# Discussion

This study explored language attrition and identity dynamics among bilingual adolescents in Azerbaijan, focusing on how social, institutional, and personal factors shape language use in L2-dominant environments. Grounded in the Language Dominance Framework and Social Identity Theory, the findings offer insights into how bilingual adolescents navigate their linguistic identities in contexts where English serves as both the language of instruction and a symbol of social prestige and academic success.

# Language Dominance Framework: Sociocultural and Institutional Influences on L1 Attrition

The Language Dominance Framework underscores the adaptability of language use in response to sociocultural contexts, exposure, and perceived utility. L2 dominance is influenced by a combination of peer influence, academic requirements, and institutional policies that prioritize English as the primary language of communication and instruction

(Schmid, 2011; Yilmaz, 2019). Bilingual adolescents increasingly favor English over Azerbaijani, driven by its association with academic success, social integration, and perceived prestige. This shift is particularly evident in educational settings, where English is not only the language of instruction but also the key to social acceptance and academic achievement.

Building on the Complementarity Principle (Grosjean, 2008), the findings reveal that participants allocate English to academic and social domains while relegating L1 to informal family contexts. However, participants also reported struggles with L1 fluency, as their proficiency in the language diminished. This decline in L1 proficiency is consistent with Kupisch and van de Weijer's (2015) observation that limited exposure to L1, especially in academic settings, leads to incomplete acquisition and eventual attrition of advanced language structures. In the present study, participants demonstrated a significant functional limitation of L1 in school-related tasks and academic discussions.

Family language practices and community norms play a critical role in these dynamics. The findings reveal that adolescents often experienced external pressures to use English in familial and community contexts, where previously Azerbaijani had been the dominant language. One participant remarked, "I use Azerbaijani with my parents, but it is often more comfortable in English since most of my friends do too," illustrating how the shift to English is not confined to academic or school contexts but permeates the home environment as well. This reflects Pavlenko's (2000) assertion that societal attitudes and the prestige of a language can significantly influence bilingual language behavior, particularly in environments where the dominant language is associated with higher social and economic value. In the case of Azerbaijani adolescents in international schools, the prestige associated with English leads to a reduction in L1 use in both informal and formal contexts, reinforcing the dominance of L2.

In line with the work of Schmid (2011), the findings underscore how the increased use of English for academic and social purposes leads to a gradual erosion of L1 proficiency, which starts in formal domains but can extend to more informal language use over time. This shift suggests that bilingual adolescents are increasingly unable to express complex ideas in their L1, as their cognitive and linguistic efforts are predominantly directed toward English. The social and academic benefits of L2 proficiency, combined with the institutional policies of English-medium education, push L1 to the periphery of adolescents' daily lives, leading to a reordering of linguistic priorities where L2 becomes the dominant mode of communication.

As adolescents align more with their English-speaking peers and experience the social and academic benefits of using English, their connection to L1 weakens, creating a growing divide between their native language and the language they use for social mobility and academic success. These shifts in language use and identity are deeply influenced by the link between institutional policies, peer expectations, and family practices, which together shape adolescents' linguistic behavior and cultural affiliation.

# Social Identity Theory: Identity Realignment and Linguistic Group Affiliation

The findings of this study revealed the critical role of identity realignment in understanding the shift in language use among bilingual adolescents. According to Social Identity Theory (Tajfel & Turner, 2001), adolescents' identities are shaped by their affiliation with linguistic and cultural groups.

As adolescents in this study adopted more English-speaking practices, their sense of belonging to the L2 group became tied to their linguistic identity. Participants expressed feeling more connected to the international community and increasingly distanced from their native Azerbaijani culture. This shift emphasizes the idea that the prestige of L2, particularly in academic and social domains, plays a central role in shaping adolescents' identities. The use of English became a symbol of social mobility and global integration, a phenomenon noted in earlier studies (e.g., Cavallaro & Serwe, 2010), where bilingual speakers of Malay increasingly aligned with English for social and economic benefits, relegating their native language to family interactions. As Schmid (2004) observed in contexts of migration, individuals often realign with the dominant language group as part of redefining their social identity. This finding was echoed in Schmid and Dusseldorp's (2010) work, which suggested that the social pressure to conform to the dominant language of the group often leads individuals to distance themselves from their native language, as it is perceived as limiting social mobility.

The adolescents in this study reported that their decision to adopt English was also influenced by the comparative dynamics within their peer groups. Social Identity Theory posits that once individuals align with a group, they engage in social comparison, evaluating their group relative to others (Tajfel & Turner, 2001). Schmitt and Sorokina (2024) suggest that bilinguals often adjust their language use based on the perceived advantages associated with the dominant language. In this study, bilingual adolescents compared their proficiency in English with their peers, reinforcing the notion that L2 use signals social success.

In educational contexts where English is regarded as a key to enhanced social mobility and prospects, the students in this study progressively aligned themselves with English. This shift contributed to a decline in their proficiency in Azerbaijani. According to Alasgarova et al. (2024), this cultural attrition results in the erosion of native cultural values and alters the transmission of cultural norms and practices. As participants in this study adopted the behaviors and norms associated with the dominant English-speaking group, they also distanced themselves from their Azerbaijani identity. This process not only impacted language retention but also the intergenerational transmission of cultural values, which is crucial in bilingual contexts where both linguistic and cultural heritage are at risk of being lost.

# Emergent Theory: L2 Dominance as a Mediator of L1 Attrition and Identity Shift

The selective coding process led to the development of a core theoretical model: L2 dominance as a mediator of L1 attrition and identity shift. This emergent theory posits that L2 dominance is not merely a byproduct of reduced L1 exposure but a mediating force in the process of identity transformation (Figure 5). As L2 gains prestige and functional utility in academic and social contexts, it increasingly becomes the language of social integration, pushing L1 to the periphery of everyday use, especially in informal, familial contexts.



Figure 5: L2 Dominance as a Mediator of L1 Attrition and Identity Shift

As adolescents adapt their linguistic identities to meet the functional and social demands of their environment, L2 use becomes further entrenched, reinforcing both the attrition of L1 and the realignment of identity. The increasing reliance on English for communication leads to gaps in L1 proficiency, which is often filled by code-switching or the hybrid use of both languages, a phenomenon observed in the findings as adolescents balance linguistic identities in response to their changing social worlds.

#### **Implications for Educational Policy and Practice**

The findings highlight the urgent need for educational policies that foster balanced bilingualism and support the maintenance of both L1 and L2. The emphasis on English-only policies in schools, while beneficial for academic success in international settings, poses a risk for L1 attrition and the erosion of cultural identities. As such, educational systems should consider incorporating strategies that integrate native languages into the curriculum, ensuring that L1 remains a functional and valued tool in both academic and social contexts (Peltokorpi & Vaara, 2012).

Furthermore, educators should be mindful of the role of peer influence and social identity dynamics in shaping adolescents' language use. Promoting an inclusive environment that values both L1 and L2 equally could reduce the sociocultural pressures that drive L1 attrition, thus allowing bilingual students to retain their cultural identity while benefiting from the social prestige of L2.

#### **Limitations and Future Directions**

Despite the valuable insights offered by this study, limitations should be acknowledged. The study's cross-sectional design captures a snapshot of participants' experiences, but longitudinal research would be valuable to understand how language dominance and identity shifts evolve over time (Dörnyei, 2007). Additionally, the focus on bilingual adolescents in a

specific context limits the generalizability of the findings to other cultural or educational settings.

Future research should explore how these dynamics unfold in different sociocultural contexts, considering the role of family and community influences more broadly, and whether similar patterns of language attrition and identity shifts occur across diverse educational systems.

# Conclusion

This study examines language attrition and identity shifts among bilingual adolescents in Azerbaijan, focusing on L2 dominance as a mediator. The findings reveal that L2 dominance, driven by institutional policies, peer influence, and the prestige of English, contributes significantly to the erosion of L1 proficiency and the redefinition of social identities. As L2 becomes more prominent, L1 is relegated to informal settings, leading to both linguistic and cultural shifts. The developed theoretical model highlights the dynamic relationship between language attrition and identity shift, showing how sociocultural pressures reinforce L2 dominance and accelerate both processes.

These findings underscore the need for educational systems to support balanced bilingualism by integrating L1 into curricula and fostering environments that value both L1 and L2. By promoting bilingualism and mitigating sociocultural pressures, schools can help preserve cultural identity while enabling students to succeed in a globalized world.

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# The Collaborative Mobile Ancient Route Learning for Supporting Geo-History Knowledge and 4C's Skill Through Google Map Applications

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#### Abstract

Since the advancements in technology, it has led to a transformation in various learning approach. The convenience to access information from online databases has rapidly prompted schools worldwide to start incorporating certain technologies into teaching and learning practices as deemed appropriate. In this research, the Google Maps application was utilized to design learning experiences for Grade 10th students to enhance their comprehension of Geography and History including The 4C's skill, which was achieved from the Dvaravati field trips, and assessing learning outcomes by creating the ancient route maps through the Google Maps application. According to the learning achievement, and the self-assessment of 4C's skill founded that most of learners could develop the 4C's skill and gain a deeper comprehension in term of knowledge content after exploring the CMGH field trip significantly, the statistic significant findings (p<0.05). In addition, most of learners could accurately create the ancient maps according to geography and history learning could support the acquisition of Geography and History knowledge effectively.

Keywords: Collaborative Mobile Learning, Google Map, 4Cs Skills

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# Introduction

Geography education is basically developed toward the trendy technology because it's necessary to use tools to study and research the physical change in Geography. In the last decade, Geography information systems considered as the potential instrument to support classroom learning through student driven inquiries in many aspects of natural and social domains. In particular, the use of Project-based learning, and Problem-based learning (PBL). Nevertheless, GIS has been considered as the fundamental system studying, analyzing Geography since 1960.

Accessing to technological education remains a core barrier in developing education. However, in this decade, IOT, Internet of Things covered and also disrupt those obstacles. Learners can even use smartphone to search any data and knowledge through online database. As learning geography, In addition to GIS, there are various mobile applications supporting Geography education accessibly. For instance, Google map, Google Earth, Map Me, Here We Go, etc. In addition to support learning, it also supports the navigation.

In this present, mobile applications 's necessary in every aspect of daily life inevitably. It's considered as an essential part of both virtual and physical learning. By the way, exploring, experiencing in the field can be an absolute advantage. Learners can see and visit in the real world. According to the significance of mobile applications, and field learning, author studied the advantage of hybrid learning between Google Map application, and field trip in Dvaravati Route in ordered to create the ancient route map in Dvaravati period of Thailand.

# **Related Studies**

# Collaborative Learning

Collaborative learning is the educational approach of using groups to enhance learning through working together. Generally, groups of learners work together to solve problems, complete tasks, or learn new concepts. This approach actively engages learners to process and synthesize information and concepts, rather than using rote memorization of facts and figures. In addition, this approach allows learners work together on projects, where they must collaborate as a group to understand the concepts being presented to them. Rizki Amalia (2018) proposed that collaborative learning is significant learning approach supporting skill need in 21st century (Rizki Amalia, 2018). There are many benefits of collaborative learning as follow: Develop group discussion and leadership skill, increase learner skill and knowledge, improve relationship among learners, Improve knowledge acquisition and retention.

Nowadays, learning approaches are rapidly develop consorting with accessible technology and tool in education. Students could individually learn through many online-databased content, in particular, after the epidemic of Covid-19. Nevertheless, it can't deny that Collaborative learning remains an effective approach. Especially in Geography education, Yangzom and Phu-Ampai (2017) opined that students could get a high level of satisfaction, learning behavior toward collaborative in teaching topographical map in Grade 10th students. Similar to Jochecová et al. (2022), studying the potential of CIVEs, the collaborative immersive virtual environments to create hypsography map (Jochecová et al., 2022). Nevertheless, the hypothesis that collaborative learning had limitations in some levels, Huh and colleagues (2021) opined that working in small group is more effective in K-12 students studying Geography task.

# Mobile Learning and Google Map

Mobile learning, mLearning, is an approach of accessing learning content through mobile devices. This approach empowers learning at the point of need, enabling users to access content whenever and wherever suits them. The most significant advantage of mLearning is to focus the ability of learners to choose when and where they want to access means that they can go at their own pace, increasing engagement and improving knowledge retention. There are several significances of mLearning in particular the context of academic. First, its convenience to microlearning content through video, gamification, and more interactive content. Second, the social learning engagement. Third, the seamless access through IOT.

MLearning's considered as a widespread learning approach for decade. It has an important role supporting Geography education in every level. Lan and Wang (2010) studied the effect of GPS and E-map in the Junior High School students. Instructor assigned them to find the direction in Geography mLearning. In addition, it also popularized use to teach in the higher education. Ganguly (2023) used mLearning through the integrated GPS in K-12 students. Like Silaban et al. (2023), she agreed that smartphone is a portable device supporting a geographical learning. In particular, field study. Nevertheless, this present, Augmented reality (AR) is gradually applied to this field obviously. Falk and Chatel (2017) created SmartGeo as an augmented reality as the other alternative Geography learning application.

There are several mobile applications assisting the navigation and geographical database. They are necessary for daily life in many contexts. For instance, navigation, journey, tourism, and education. Google Map is considered as a pillar of navigation with more than 1 billion monthly users. It was the most downloaded map and navigation app in the US in 2022, with 9.12 million downloads. It can access and connect with others application, which involve. In addition, it can access the real view in each place that users want to observe through Google Street View. According to its convenience, its system also present terrain on the bird eye view too. Lazaro and Duart (2023) opined that Google map could increase the comprehension in map and geography.

Nowadays, Geography education isn't limited only in mapping terrain, It can promote to others science, knowledge, and economy. In 2010s, Google map was the most effective navigation application to use in learning Geography. At the same time, its technology also can support tourism in rural area. Ahmad and colleagues (2023) used this software to support rural mapping and toponym inventory promoting tourism in Central Java, Indonesia. It could pin location as tourist attraction, restaurant, convenient store, and accommodation. Furthermore, it was applied to the virtual teaching. Cahyono and Sidiq Anggoro (2017) used Google Map as the learning approach for Tourism Geography course. It could support tour guiding and planning proficiently.

#### **Description of Overall Conceptual Framework**

#### Background and Overall Structure

Field trip is an essential learning activity for Social studies, students explored the real world historical site to learn History through Architecture, Antique, and Geography. Mobile

learning was applied to assist learners through the navigation and map application. Learners were assigned to use mobile application creating the ancient map toward Dvaravati route in ordered to comprehend the relation of location and geography affecting to human civilization in Dvaravati period. Dvaravati trip are a required field trip for Grade 10<sup>th</sup> students in the Engineering Science Classroom, King Mongkut's University of Technology Thonburi.



Figure 1: Overall Structure of Learning Process in Collaborative Mobile Learning for Geography and History Learning (CMGH)

# **Research Design**

#### **Participants**

The participants in this study were 76 students in grade 10<sup>th</sup> of Engineering Science Classroom, King Mongkut's University of Technology Thonburi. All participants enrolled in ESC422 The Navigator course. All participants already learned the history of Dvaravati and Sukhothai Kingdom. The participants received google map training before participating in the field trip around Nakhon Pathom and Ratchaburi Province for 3 days and 2 nights.

#### Procedure

The learning process in this study will start with all of the participants enrolled in the ESC422 course. After that, the process will be divided into 5 parts as presented in figure 2. Part 1 will start with all of the participants being divided into groups (6 person/group) (A). In part 2, all participants participated in google map training activity in the classroom (B). Next, part 3 will start with all participants participating in a field trip for 3 days and 2 nights (C). During the field trip participants will listen to a lecture on the history of each area. After that, participants surveyed the area using google map on their mobile phone as a tool. Then, part 4 will start with participants designing ancient maps of each area from surveys through google maps on their mobile phones (D). Finally, part 5, participants will present their map to peers and teachers to evaluate learning outcomes (E).



Figure 2: Learning Process in Collaborative Mobile Learning for Geography and History Learning (CMGH)

#### Data Collection and Data Analysis

In this study, there were 2 instruments for evaluate learning achievement. First, ability to applied google map for drawing an ancient map and understanding of geography knowledge of student. In this assessment it will be evaluated by the teacher based on the rubric. Second, ability to understand in geography and history from self-assessment before and after participating in field trip. Using self-rating on a scale of 1-5 in each questionnaire. After that, all of data will be analyzed by statistical program using t-test.

#### **Results and Discussion**

#### Learning Achievement by Teacher Evaluation

From some of students' work as presented in figure 3., it was found that the students were able to apply the drawing of ancient maps from surveys using the google maps application on their mobile phones very well. Because the travel route can be clearly specified. In addition, the scale of the map can be specified appropriately and correctly according to geographic principles. Therefore, when evaluating according to rubric, the score of most students has an average of  $7.62\pm0.63$  out of a full score of 10.



Figure 3: The Ancient Map From Learner's Assignment

#### Students' Self-Assessment Score

Based on the self-assessment result of the understanding in geography and history knowledge of student before and after participating field trip. It was found that most students perform at the higher score of learning achievement after participating field trip as shown in table 1. This implies that using the google map application on their mobile phone to surveys the area while participating in field trip can promote students understanding in geography and history at a higher level as shown in Table 1 and Figure 4.

Table 1: Students' Self-Assessment Score						
Skills	Experiment	п	Mean±SD	t	Р	
Geographical	Before	76	$2.22 \pm 0.08$	15 35	<0.001	
comprehension	After	70	3.87±0.09	15.55	<0.001	
Historical	Before	76	$2.20\pm0.08$	11 55	<0.001	
comprehension	After	70	3.80±0.09	11.55	<0.001	
Collaboration	Before	76	$2.87 \pm 0.08$	12.25	<0.001	
Collaboration	After	70	3.89±0.09	12.23	<0.001	
Croativity	Before	76	$2.75\pm0.08$	12 11	<0.001	
Cleativity	After	70	3.78±0.05	13.11	<0.001	
Communication	Before	76	$2.68 \pm 0.07$	11 51	<0.001	
Communication	After	70	3.57±0.09	11.31	<0.001	
Critical thinking	Before	76	2.96±0.08	12.15	<0.001	
	After	70	4.02±0.03	12.13	<0.001	



Figure 4: Students' Self-Assessment Score

#### Conclusion

In this study investigated the development result of understanding in geography and history knowledge of students through a mobile-learning collaborative field trip. From the results can conclude that most student are able to use application on their mobile phones such as a google map application as a tool to help them study in geography and history. From this

study, it can be inferred that if teachers choose an application (M-learning) that are appropriate for students' learning. It may result in students being able to learn faster than teaching in a lecture-based learning only.

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# Design of Project-Based Learning to Support Bioprocess Understanding in Kombucha Project: Integrating Design, Plan, Analysis and Present

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#### Abstract

Since the continuous development of Technology in the context of manufacturing, and education sector, the collaboration between manufacturing and education has rapidly adjusted school curriculum to create the new learning approaches. In this research, Kombucha fermentation process was utilized to design learning bioprocess comprehension for the 41 Bioengineering students (Grade 11<sup>th</sup> students) who will become a machine operator. In addition, this approach also promoted the soft skills such as, Design, Planning, Analysis, and Presentation through Project-Based Learning, which was achieved from the process of Kombucha fermentation, and assessing the learning outcomes by making the edible Kombucha through the application of scientific tool and equipment for measure parameter. According to the learning achievement, and the self-assessment of the soft skills, found that the majority of learners could develop the soft skills and increase the bioprocess comprehension after doing the PBKI experiment significantly. The statistic significant findings (p<0.05). In addition, most of learners could make the edible Kombucha according with bioprocess principle. It can be concluded that the Project-Based learning design through Kombucha fermentation can effectively promote the soft skills among learners and significantly enhance their comprehension of bioprocess.

Keywords: Bioprocess, Kombucha, Project-Based Learning

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#### Introduction

Nowadays, there are many household products are produced from microorganisms, which has different production methods. But one process that all these products have in common is bioprocess. (Rationalized) Bioprocess's not considered as a new manufacturing process, its evolution has originated for many centuries along with human civilization. Its advantage aims to preserve food and beverages and develop to creating new products from microorganism. For instance, Wine, Beer, and others type of fermented product.

Bioprocess has generally an important role in various aspect. In particular, the industry, it can convert industrial waste and by-products into value-added products in the industry; this biocatalysis-based technology has gained increased attention recently. Comparing with the traditional chemical synthesis processes, bioprocess shows many advantages: mild reaction conditions, environmental friendliness, and a broad range of substrates (Zhang et al., 2019). Nevertheless, there are some disadvantages in the processes, such as instability and lower expression of enzymes, poor performance under certain reaction conditions, high cost due to the complex downstream processing, and limited knowledge in microbiology and the designing of bioprocesses. Therefore, biotechnologies are in demand for novel bioprocesses to develop efficient, sustainable, and economical bioprocesses.

This process consists of feedstock pretreatment, fermentation or biocatalysis, and downstream processing or separation for product recovery and purification. The actual bioprocess are largely dependent on the substrate and organisms used and the nature and applications of the final product. This section will briefly discuss organism choice, fermentation bioreactor design, and separation methods.

Bioprocess mostly associated with fermentation inevitably. Kombucha's considered as a fermented, lightly effervescent, sweetened black tea drink. It is called kombucha tea to distinguish it from the culture of bacteria and yeast. Nowadays, it can be prepared at home or commercially. It was made by dissolving sugar in non-chlorinated boiling water. Tea leaves are then steeped in the hot sugar water and discarded. The sweetened tea is cooled, and the SCOBY culture is added.

In this current, Project-based learning were gradually applied in those laboratory process, It defined as a teaching method in which students learn by actively engaging in real-world and personally meaningful projects. It involved students designing, developing, and constructing hands-on solutions to a problem. The educational value of PBL is to build students' creative capacity to work through difficult or ill-structured problems, commonly in small teams.

According to the development of bioprocess, and Kombucha production, which is rapidly popularized in the current, Project-based learning were used to design learning pedagogy through Kombucha Project. Using Bioprocess as a core theory fermenting those production. In order to consort with 5 skills, involve as follow: Design, Plan, Analysis and Present.

#### **Related Studies**

#### **Bioprocess**

Bioprocess is considered as a specific process that uses complete living cells or their components (e.g., bacteria, enzymes, chloroplasts) to obtain desired products (Shirinzade,

2022). Transport of energy and mass is fundamental to many biological and environmental processes. Basically, bioprocess was divided into 3 processes. First, cell bioprocessing, the bioprocess engineer that reproduce and robust manufacturing process to produce therapeutic cells. Second, upstream bioprocess, the entire process from early cell isolation and cultivation to cell banking and culture expansion of the cells until final harvest. Third, downstream bioprocess, the part where the cell mass from the upstream are processed to meet purity and quality requirements. According to the definition of bioprocess in each process, it defined as the creation of useful products using a living thing. It's an essential process producing various bio-production (Rendón-Castrillón et al., 2023).

Nowadays, Bioprocess is widespread over every unit of production. It's versatile process that uses living organisms, such as bacteria, yeast, and fungi, to produce a wide range of products. Kortam (2018) divided the benefit of bioprocess into main three criteria as follows (Kortam et al., 2018), Firstly, Sustainability, one of the primary benefits of bioprocessing is that it is environmentally friendly. Bioprocessing uses natural resources to produce products, such as plant material, agricultural waste, and even algae. In addition, it uses the renewable resources. Secondly, Lower Production cost, in this term, microorganism was used in this process means that large quantities of products can be produced in a short period of time. It can reduce the production cost. Lastly, increased economic growth, Markula and Aksela (2022) opined that bioprocessing can create new markets and opportunities for small and medium-sized enterprises (SMEs) (Markula & Aksela, 2022). In addition, it can help to create new jobs in industries that are focused on bioprocessing.

Bioprocesses considered as a manufacturing process which appear for many centuries through the world history. It initially developed from winemaking in Mesopotamia. Brewing was one of the applications of bioprocess engineering. However, it was not until the nineteenth century that the scientific basis of fermentation was established. Louis Pasteur, who discovered the microbial nature of beer brewing and wine making. In the 21<sup>st</sup> century, progress in bioprocess engineering has followed the development of genetic engineering, which raises the possibility of making new products from genetically modified microorganisms and plants grown in bioreactors. It required contributions from a wide range of disciplines, including microbiology, genetics, biochemistry, chemistry, engineering, mathematics, and computer science.

# **Project-Based Learning**

Project-based learning can be called as PBL. It involves students designing, developing, and constructing hands-on solutions to a problem. The educational value of PBL is aims to build students' creative capacity to work through difficult or ill-structured problems, commonly in small teams (Zhou, 2023). In addition, it defined as a teaching method in which students learn by actively engaging in real-world and personally meaningful projects (Thi-Kim Le Ho Chi, 2018). According to PBL definition, PBL's considered as an important learning approach supporting Science Project inevitably. Sivaloganathan (2015) founded that there are 4 procedures in Science Project, especially in laboratory: experimental design, conducting and collecting data, analysis, and interpretation from the result.

Project-based learning is basically defined as various definition. In particular, Science Project experiment, Kotsis (2024) opined that Experiments are essential to inquiry-based science education because they give students practical experiences that enhance their comprehension of scientific concepts. In addition, Leite and Dourado (2013) also opined that Science project

is conceptualized as solving problem through experiment (Leite & Dourado, 2013). According to the significance, Project-based learning could improve student's active thinking, hand-on, and teamwork ability.

Project-based learning initially developed form Project learning in 2000s. It was a model that organizes learning around projects. It developed form the traditional learning approach. The PBL teaching model emphasizes the need for teachers to immerse students in practical situations and learn. Students who have more practical goals for their learning will also have more substantial guidance than passive as traditional teaching to absorb knowledge. Putri et al. (2021) opined that traditional teaching method mainly prioritized to teacher, but PBL could create atmosphere of learning so that students can actively develop their potential (Putri et al., 2021). Similar to Sumarmi et al. (2021), PBL mode can improve the traditional teaching problems (Sumarmi et al., 2021). Project-based learning promotes students' active learning by strengthening the learning of educational skills in an interdisciplinary and multidisciplinary way.

Project based learning's considered as an essential pedagogy encouraging learner's interest in particular, collaborative method. Yachulawetkunakorn and colleagues (2017) applied hand-on activity and science fair as one of the steps of Project-based learning (Yachulawetkunakorn et al., 2017). In addition to the context of collaborative method, learners could create artefacts, technological tools, problem-centreness, and certain scientific practices through PBL. Currently, educators promoted PBL in Primary school students consorting with Xiong (2021), she opined that learner had a positive attitude toward PBL in Grade 7<sup>th</sup> student. In particular, motivation and attitude.

# Description of Project-Based Learning to Support Bioprocess Understanding and Integrating Design, Planning, Analysis and Present Skills in Kombucha Project

# Background and Overall Structure

Kombucha project is a one of project that belong to Science Project course for students in the second year (Grade 11<sup>th</sup>) of Bioengineering program at KOSEN program, King Mongkut's University of Technology Thonburi. According to the course description, this project is designed under concept of Project-based learning to encourage students in the Bioengineering program to comprehend about the important process, which is called bioprocess. Bioprocess is an important process in controlling, designing, and developing production from microorganisms. Therefore, learning through Project-based learning (Kombucha project) can encourage students to understand bioprocess easier, because the learners were required to do the experiment by themselves. Moreover, learning through Project-based learning also promotes student to practice of design, plan, analysis, and presentation skills.

The learning process in Kombucha project is divided into 5 parts. Part 1 initially start with a lecture class for students to understand the definition of bioprocess and the relation between bioprocess and kombucha fermentation process. After that, student divided groups in order to brainstorm to design the topics and bioprocess for kombucha fermentation project. Part 2 initially start from students present their designed project topics and bioprocess to the teacher. Then, the teacher gave some suggestions for improvement focus on bioprocess. Part 3 After the teacher approved the project topic and bioprocess, student would write the project proposal to determine the scope of project and work planning. Part 4 start from fermenting kombucha follow design in proposal and collect the sample to determine some parameter

with various tools such as pH meter, reflectometer, microplate reader. After that, the results were analyzed with a statistical program. Finally, Part 4, students presented their results focus on the relation between bioprocess and kombucha fermentation process to peer and teacher. The teacher evaluated and scored them. In case of the student self-assessment aimed to assess the comparative bioprocess's understanding after completed the project. Which is presented in Figure 1.





# **Design of Learning Activities Process**

The learning design process in this study is based on the concept of Project-based learning. The Kombucha Project was used as a model for encourage students to understand the mechanisms of bioprocess through integrating design, plan, analysis, and presentation skills of student. In each process of learning, various technologies were used as a tool. Learning process in the Kombucha project is divided into 5 processes within 1 semester (approximately 18 weeks). The details of each process were described in the Table 1.

 Table 1: The Correlation Between Learning Process in Kombucha Project and Bioprocess

	Contration Between Learning Process in Kombucha Project and Dioprocess
Activity	Process
Part 1:	In this part started from the teacher explained the definition of bioprocess to
Project	student in the classroom and give some assignment such as, search the
preparation	information on internet about bioprocess in some product from
(week 1-2)	microorganism. After that, the teacher would create a small workshop that
(	involve with bioprocess for student. So in this part student would know the
	definition of bioprocess and bioprocess's understanding in kombucha
	fermentation and the production of products from microorganisms
Part 7.	In this part started from the teacher showed some parameter that effect to
Design	high high part started from the reduction Showed some parameter that effect to
(work  2, 5)	of microorganism ato. After that the student tried to design their experiment
(week 5-5)	for the kombushe formentation (focus on the normator that can affect to
	for the kombucha fermentation (focus on the parameter that can affect to
	bioprocess of fermentation). So, in this part student could understand about
	the parameters that could affect to bioprocess during the kombucha
	termentation as well as practiced the design problem skill too.
Part 3:	In this part started after the project title was approved by the teacher. Then,
Plan	the student would plan their experiment by writing the proposal. After that,
(week 6-9)	the student presented their proposal to peer and teacher in order to show a
	method in the experiment. So, in this part the student could understand how
	to control the parameters during kombucha fermentation as well as practiced
	the planning and presentation skill too.
Part 4:	In this part started from the proposal presentation was completed, student
Analyze	began the experiment as planned in the proposal. During the experiment,
(week 10-	various parameters were controlled according to the bioprocess mechanisms.
16)	Various parameters were measured with different instruments. The results of
	the experiment would be analyzed with a statistical program. So, in this part
	student would have an experience in bioprocess control for determine the
	guality of kombucha fermentation as well as practiced the analysis skill too.
Part 5:	In this part started after the analysis of an experimental results were
Present	completed Then presented the results to peer and teachers with oral
(week 17-	presentation to discuss the experimental results. In addition in this part the
(WCCK 17 18)	teacher evaluated the student from a presentation and report Meanwhile
10)	students would assess themselves in term of the comparative the
	bioprocess's understanding and skill before and after completed this project
	So in this part some student could explain about the mechanism of
	so, in this part some student could explain about the mechanism of
	bioprocess that occur during their experiment and more understand about
	bioprocess. In this part started from the proposal presentation was
	completed, student would begin experimenting as planned in the proposal.
	During the experiment, various parameters were controlled according to the
	bioprocess mechanisms. Various parameters were measured with different
	instruments. The results of the experiment would be analyzed with a
	statistical program. So, in this part student would have an experience in
	bioprocess control for determine the quality of kombucha fermentation as
	well as practiced the presentation skill too.

# **Research Design**

# **Participants**

The participants in this study were 41 second year students (Grade 11<sup>th</sup>) of Bioengineering program in KOSEN program, King Mongkut's University of Technology Thonburi. All participants enrolled in a science project course.

# Procedure

The kombucha projects were consisted of 5 part which were presented in Figures 2–3.



Figure 2: The Procedure of the Kombucha Project in Parts 1-3

Figure 2 showed the process of kombucha project in part 1-3. First, the student learned about the definition of bioprocess and history of kombucha in classroom (A). Then, students participated in workshop activities that involve with the bioprocess in kombucha fermentation (B). After that, students gathered groups and design their experiments for kombucha fermentation present to peer and teacher (C). After the presentation was finished, the student planned the experiment as they designed (D).



Figure 3: The Procedure of the Kombucha Project in Parts 4–5

Figure 3 showed the process of kombucha project in part 4–5. Initially started with students conducted experiments as they planned (A). Then, students collected the results and analyze with statistical program (B). After that, presented the results to peer and teacher (C). Finally, the students were assessed by teachers on presentation and report. At the same time they assessed their understanding of bioprocess from this project (D).

# **Data Collection & Data Analysis**

The data collection in this study was divided into 2 forms: First is the evaluation from teacher in terms of bioprocess's understanding in kombucha fermentation, which's assessed from the presentation and experimental report's writing. Second is students' self-assessment of bioprocess's understanding, design, plan, analysis, and presentation skills that has changed before and after completing the project. Using self-ratings on a scale of 1–5 in each questionnaire. The result of self-assessment was analyzed with SPSS program by using paired t-test.

# Result

# Learning Achievement

Based on the teacher assessment by using a rubric on the accuracy of their description of the bioprocess. It was found that all the student' assessments were at grade A (average score is  $86.72\pm3.31$ ), mean that they were able to correctly describe the bioprocess that takes place during kombucha fermentation.

# Student Self-Assessment Score

From the results of the student self-assessment, it was found that most students performed at the higher score of learning achievement after do the kombucha project, as shown in table 2 and figure 4. It means that students can develop their understanding in bioprocess as well as design, planning, analysis, and presentation skills after do the kombucha project.

Skills	Experiment	n	Mean±SD	t	Р
TT 1 4 11	Before	4.1	2.13±0.11	12.25	-0.001
Understand bioprocess	After	41	$3.94{\pm}0.07$	13.25	<0.001
Design abill	Before	41	2.19±0.11	12.54	<0.001
Design skill	After	41	$3.90 \pm 0.09$	12.34	<0.001
Dlamina alvill	Before	41	2.30±0.11	11.52	<0.001
Planning skill	After	41	$3.93 \pm 0.09$	11.55	<0.001
A malaysia alaill	Before	41	2.27±0.11	10.07	<0.001
Analysis skill	After	41	$3.89 \pm 0.08$	10.97	<0.001
Dragontation abill	Before	41	2.33±0.11	11.20	<0.001
	After	41	$3.94 \pm 0.08$	11.29	<b>∼</b> 0.001

Table 2: Students' Self-Assessment Score Before and After the Kombucha Project

\*P<0.05



#### **Student Development Skills**



#### The Kombucha Project Development of Student Skills

From the result showed that the most developing skill after do the kombucha project was planning skills is 33.75%, analysis skill is 32.50%, design skill is 20.00% as well as presentation skills is 13.75% (Figure 5).



Figure 5: The Student Skill Developed After the Kombucha Project

# **Discussion and Conclusion**

This study investigated the development of understanding bioprocess of bioengineering student through do kombucha project. In addition, planning skill, analysis skill, design skill and presentation skill has also been developed. Because, during learning process the student gain experience in controlling bioprocess from various parameters to kombucha fermentation that students design by themselves. So, students will encounter problems and must find solutions from real situations on their own.

From the results can conclude that learning with Project-based learning able to support the ability to understand bioprocess during product production. Moreover, planning skill, analysis skill, design skill and presentation skill has also been developed. Therefore, if

teachers want students to understand bioprocess in product production more. Students should learn through do some project rather than lecture in classroom only.

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#### ESL Students and Teachers' Perceptions of Qualities of English Language Teachers

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#### Abstract

The qualities of a good English language teacher play a key role in the effective English language instruction. Most importantly, students are influenced by the good qualities of a language teacher. Hence, the present paper delves into the students' perceptions of the essential attributes and characteristics that define good English language teachers. A structured questionnaire has been administered through online mode to 435 students across disciplines such as: engineering, science, humanities and social sciences. The questionnaire contained 10 statements on the subject knowledge, personality, adaptability, learning environment, passion for teaching, versatility, interpersonal communication skills, and professional development as key qualities and components of effective English language teachers. Students had to mark their responses to the statements from the five options given on the Likert Scale. Informal interviews with 10 experienced teachers, classroom teaching observation, and student feedback of teaching were also used to obtain data. Results showed that "Teachers must know their subjects well" ranked in the first position with the weighted average of 4.68; and *versatility* is ranked the lowest in the tenth position indicating a lower level of consensus among respondents on its significance in effective teaching. By synthesizing existing literature and conducting surveys and interviews with both students and educators, this paper aims to shed light on the multifaceted nature of effective English language instruction. The findings provide valuable insights for teacher training programs, educational institutions, and language instructors, contributing to the enhancement of English language teaching and learning outcomes.

Keywords: Teachers' Perceptions, English Language Teachers, Language Teacher Qualities

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#### Introduction

The role of an English language teacher in imparting critical skills is pivotal, as they bear the responsibility of nurturing linguistic competence and shaping the language learning experiences of countless individuals. Therefore, effective English language teaching demands a unique set of qualities and attributes, which, when embodied by educators, can significantly influence the success of language instruction. This research paper embarks on an exploration of the qualities that describe a good English language teacher, seeking to shed light on the multifaceted nature of effective language instruction and its impact on learners. By examining these qualities in detail and their implications for both educators and students, this study aims to contribute to the enrichment of language education, teacher development, and, consequently, the overall advancement of individuals striving to master the English language. The qualities that make a good English language teacher are not only of academic interest but also the real-world applications that can shape the linguistic journey of learners across the globe. By synthesizing existing literature and conducting surveys and interviews with both students and educators, this study aims to shed light on the multifaceted nature of effective English language instruction. The findings of this study provide valuable insights for teacher training programs, educational institutions, and language instructors, contributing to the enhancement of English language teaching and learning outcomes.

#### Significance of Study

The significance of researching the qualities of a good English language teacher lies in its potential to enhance the quality of language education and its far-reaching impact on students, educators, and educational institutions. By identifying and understanding the qualities that define a proficient English language teacher, this research not only assists in the professional development of educators but also contributes to improved learning outcomes and student motivation. Moreover, it has practical implications for teacher training programs, curriculum design, and educational policies, ultimately fostering a more inclusive and effective approach to English language instruction.

#### The Aim and Objectives

The present study is guided by the following research questions:

- 1. What are the key qualities and attributes that students and teachers consider essential for a good English language teacher?
- 2. To what extent do interpersonal qualities of English language teachers impact students' language proficiency, motivation, and overall learning experiences?

The objectives of the present student are – To understand how interpersonal qualities such as subject language proficiency, matter knowledge, communication, empathy, and the ability to build rapport contribute to the effectiveness of English language instructors; To determine the role of adaptability in responding to diverse student needs, including those of various learning styles and proficiency levels; and To investigate how the qualities of a good English language teacher influence students' language proficiency, motivation, and overall learning experiences.

#### Literature Review

A good teacher affects eternity; he can never tell where his influence stops (Crawford, 2004). According to Khaerati (2016), the characteristics of an effective teacher will determine the success of teaching and learning process. In Melek Koc's (2012) opinion, teacher is one of the main factors that has a lot of influence on students' achievement, performance and their success. Similar factors were evident in the research conducted by Zamani, Roya and Ahangari, Saeideh, (2016) that students expected a good English teacher to have the ability to develop proper relationships, ability to build students' confidence, ability to maintain discipline in the classroom. Thus, there is always an agreement on the fact that having an effective teacher is the basic requirement of an EFL class for effective functioning of educational systems and for improving the quality of learning (Babai & Sadeghi, 2009).

Good language teachers build rapport by caring about their learners, demonstrating patience and respecting the learners. Thompson (2008) is of the opinion that good language teachers are well-prepared, able to select appropriate frameworks for their lessons and able to design interesting tasks. In general, English teachers, compared to any other subject teachers, play a unique role and are special in connecting socially, personally, and in academic matters with their students. They also create a desirable classroom climate, to plan a variety of learning activities, and to use materials of instruction effectively. According to Richards (2002), teaching a wide range of students needs good preparation based on their interest and ability. Moreover, it is said that the students' perceived organization and communication skills as the most important characteristic, while the teachers perceived English language proficiency as the most important characteristic (Wichadee, 2010).

The teacher of English has to help the students in overcoming their fears about communication and motivate them to develop more positive perceptions of communication activities. A language teacher is expected to play the roles such as – counselor, motivator, communication skills trainer etc. (Reddy et al., 2013). The effective English teachers must have the socio-affective skills to adapt well to the students, have good relationships with students, be approachable and friendly, and listen to students' points of view (Devilito et al., 2022). To help the students to make more understanding of the lesson the teachers also must know and master the vocabulary, and as an effective teacher, it is best to assess students according to what they have to get so that the students are more motivated to learn English. (Devilito et al., 2022). The relationships between students and teachers and the perceptions students have of their teachers seem to be particularly influential on students' engagement in academic undertakings. (Amerstorfer & Freiin, 2021).

In a study conducted by Zarei and colleagues (2019) it was found that characteristics of the effective English language teacher are very influential in teaching English for the students' learning and academic achievement because they can motivate the students to learn English. According to EFL students' perceptions of effective teachers' characteristics in a public university in the South of Vietnam, the group of organization and communication skills, English proficiency, socio-affective skills, and pedagogical knowledge, are the main four aspects of effective teaching. (Hung, 2023).

# Methodology

# **Participants**

The study included 435 UG and PG students, and10 English language teachers from schools and colleges across disciplines such as: engineering, science, humanities and social sciences as participants.

# Tools

The structured questionnaire contained 10 statements on the subject knowledge, personality, adaptability, learning environment, passion for teaching, versatility, interpersonal communication skills, and professional development as key qualities and components of effective English language teachers. Students had to mark their responses to the statements from the five options given on the Likert Scale. Data was also collected through semi-structured interviews with 10 English language teachers. Eight open ended questions were formulated to do the interviews which focused on exploring perceptions and experiences related to effective teaching qualities of English language teachers. Additionally, classroom observation as one of the tools was used to understand English language classes and teaching practices. Observation of some classes were video recorded for later analysis.

Content analysis i.e., student feedback was analyzed to identify qualities of a good English language teachers. Student feedback was collected from teachers to understand how students perceive teaching and teachers. The study used combination of methods for a well-rounded examination of the qualities that define a good English language teacher which provided a comprehensive basis for analysis and discussion. While employing these data collection methods, the researchers ensured ethical considerations, maintained participant confidentiality, and obtained informed consent where necessary.

# Data Analysis

# Gender Wise Analysis: Karl Pearson Correlation Coefficient Method

Correlation is a statistical technique which shows the relationship between two or more variables. The relationship between two series when measured quantitatively is known as correlation.

Table 1: Gender-Wise Anal	ysis (Male=32	28; Female=1	07)
	Male	Female	
Strongly Agree	1779	549	
Agree	1326	422	
Neutral	285	76	
Disagree	22	10	
Strongly Disagree	6	13	

The presented data employs the Karl Pearson correlation coefficient method to explore the relationship between two variables, specifically, gender (Male and Female) and respondents' agreement levels categorized into Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. The correlation value (R) of 0.9992 indicates a remarkably strong positive correlation between gender and agreement levels. In statistical terms, a correlation close to 1

signifies that high scores in one variable (e.g., Male responses) correspond consistently with high scores in the other variable (e.g., Strongly Agree responses), and similarly, low scores in one variable align with low scores in the other. In this context, the interpretation suggests that the gender of the respondents and their agreement levels move in the same direction, reinforcing the idea that there is a notable association between gender and the extent of agreement expressed by the respondents. This statistical insight provides valuable information about the relationship between these two variables in the surveyed population. The correlation value of R is 0.9992. This is a strong positive correlation as explained. High X variable scores go with high Y variable scores and vice versa which implies that Males and Females move in the same directions.

S.	Statements	*SA	Α	Ν	D	SD	WA	Rank
No.		(5)	(4)	(3)	(2)	(1)		
1	Teachers must know their subjects well.	315	107	8	3	2	4.68	Ι
2	Teachers need to be gentle and patient.	218	169	37	8	3	4.36	VII
3	Teachers need to be flexible.	165	217	45	5	3	4.23	VIII
4	Teachers need to harbour a personalized learning environment.	184	189	40	6	16	4.19	IX
5	Teachers need to inspire a positive atmosphere and optimism among the students.	296	121	13	5	0	4.63	II
6	Teachers should be passionate about their job.	247	143	39	5	1	4.49	V
7	Teachers should be versatile.	141	191	96	6	1	4.07	Х
8	Teachers should connect with their students.	276	138	17	2	2	4.57	III
9	Teachers should inspire their students to take responsibility for their learning	261	144	25	5	0	4.52	IV
10	process. Teachers should constantly work on improving their teaching skills.	225	164	41	3	2	4.4	VI

#### Table: 2 Analysis of the Questionnaire

\*SA=Strongly Agree 5; A=Agree 4; N=Neutral 3; D=Disagree 2; SD=Strongly Disagree 1; WA=Weighted Average

#### Weighted Average Method

Weighted average method is used to compute the weighted average for the students with factors such as attitude, benefits, commitment and decision making that has greatest impacts on functional matrix. For each factor the score for that option is multiplied with the number of respondents to various options. The results are added and divided by the total number of respondents in that factor are ranked in describing data order according to their indices.

$$X_{w} = \frac{\sum X_{i} * W_{i}}{No. \ of \ Respondent}$$
  
X<sub>w</sub> = Weighted Average, X<sub>i</sub> = Variable, W = Weights attached to W<sub>i</sub>

Table 2 ranks and provides weighted averages for various qualities expected of a good language teacher, as perceived by respondents. According to responses to the statement *Teachers must know their subjects well* ranked in the first position with the weighted average

of 4.68. It indicates strong agreement among respondents that a fundamental characteristic of a good language teacher is a deep knowledge of their subjects.

The second-ranked quality *Teachers need to inspire a positive atmosphere and optimism among the students* with the weighted average of 4.63 emphasizes the importance of creating a positive and optimistic atmosphere in the classroom, showcasing a high level of agreement among respondents. The statement *Teachers should connect with their students* ranked third with the weighted average of 4.57, signifies that establishing a connection with students is considered crucial for effective teaching, with a strong consensus among respondents.

Ranked fourth in the order, *Teachers should inspire their students to take responsibility for their learning process* suggests that motivating students to take ownership of their learning is seen as an important attribute of a good language teacher. Passion for the job is ranked fifth, indicating a strong consensus that enthusiasm and passion contribute significantly to effective teaching. The sixth-ranked quality suggests a shared belief among respondents in the importance of teachers engaging in continuous professional development to enhance their teaching skills.

*Teachers need to be gentle and patient*, this quality is ranked seventh, reflecting a positive but slightly lower level of agreement compared to higher-ranked qualities. Flexibility is ranked eighth, suggesting that while it is considered important, there is less consensus compared to other qualities. The ninth-ranked quality indicates that respondents see the importance of a personalized learning environment, but it is not universally perceived as critically essential. Versatility is ranked the lowest, indicating a lower level of consensus among respondents on its significance in effective teaching.

Overall, the ranking and weighted averages provide valuable insights into the perceived importance of different qualities of a good language teacher. Higher-ranked qualities with higher averages suggest stronger agreement among respondents regarding their significance in effective teaching, while lower-ranked qualities may have varying levels of importance according to respondent perspectives.

# Chi Square Test – Students' Major Subject Wise Analysis

The questionnaire collected from the students of six different major subjects which are as follows: CSE, ECE, EEE, Civil, Mechanical and Metallurgical.
S.	Statements	Calculated	Degree of	Conclusion
No		Chi-Square	freedom=20,	
		value	Table value of	
			Chi-Square	
1	Teachers must know their subjects well.	19.94	31.41	H <sub>0</sub> Accepted
2	Teachers need to be gentle and patient.	19.33	31.41	H <sub>0</sub> Accepted
3	Teachers need to be flexible.	17.72	31.41	H <sub>0</sub> Accepted
4	Teachers need to harbour a personalized learning environment.	20.67	31.41	H <sub>0</sub> Accepted
5	Teachers need to inspire a positive atmosphere and optimism among the students.	14.90	31.41	H <sub>0</sub> Accepted
6	Teachers should be passionate about their job.	16.91	31.41	H <sub>0</sub> Accepted
7	Teachers should be versatile.	11.76	31.41	H <sub>0</sub> Accepted
8	Teachers should connect with their students.	18.04	31.41	H <sub>0</sub> Accepted
9	Teachers should inspire their students to			
	take responsibility for their learning	12.96	31.41	H <sub>0</sub> Accepted
	process.			
10	Teachers should constantly work on	9.07	31.41	H <sub>0</sub> Accepted
	improving their teaching skills.			

Table: 3 Students' Major Subject-Wise Analysis

Null Hypothesis H<sub>0</sub>: There is no significant difference between department wise and given statements at 5% level of Significance.

Alternative Hypothesis  $H_1$ : There is significant difference between department wise and given statements at 5% level of significance.

The above given table 3 presents the results of a Chi-Square Test analyzing respondents' opinions on qualities of a good language teacher. The null hypothesis  $(H_0)$  in each case states that there is no significant difference in opinions regarding the specified qualities, and the alternative hypothesis  $(H_1)$  implies the presence of a significant difference. The calculated Chi-Square values are compared to the table value of Chi-Square with a degree of freedom of 20.

The Chi-Square Test results for the qualities expected of a good language teacher reveal consistent findings across various attributes. For each of the ten qualities assessed, the null hypothesis (H0) has been accepted, indicating that there is no significant difference in opinions among respondents regarding the importance of these qualities. The calculated Chi-Square values, ranging from 9.07 to 20.67, are all less than the corresponding table value of 31.41, reinforcing the acceptance of the null hypothesis in each case. These outcomes suggest a high degree of consensus among the surveyed population, indicating that the opinions regarding the importance of teachers' subject knowledge, patience, flexibility, personalized learning environments, fostering positivity, passion for the job, versatility, connection with students, encouragement of student responsibility, and continuous improvement in teaching skills are generally uniform. The findings highlight a shared perspective on the significance of these attributes, underlining the collective agreement among respondents without notable variations in opinions on these qualities of a good language teacher.

#### Analysis of Questionnaire



Figure 1: An Overview of Students' Responses to the Statements of the Questionnaire

The statement 1, Teachers must know their subjects well, suggests an overwhelmingly high expectation among students regarding the proficiency of their teachers in their respective subjects, with 97.7 percent emphasizing the importance of this quality. The statistics of the statement 2, Teachers need to be gentle and patient, reveals that 89.6 percent of students emphasize the importance of teachers being gentle and patient underscores the significant role of empathy and understanding in the educational environment. The data indicating that 88.5 percent of students, to the statement 3 *Teachers need to be flexible*, prefer their teachers to be flexible with them in the learning process. The fact that 89.6 percent of students think to the statement 4 Teachers to cultivate a personalized learning environment emphasizes a significant shift in educational perspectives towards individualized approaches to instruction. To the statement 5, the majority of 95.5 percent of students emphasizing the importance of Teachers inspiring a positive atmosphere and optimism reflects a profound understanding among students of the impact of a supportive and encouraging learning environment. The statistic revealing that 89.9 percent of students to the statement 6 believe that Teachers should be passionate about their job accentuates the profound impact of enthusiasm and dedication in the educational setting. This overwhelming majority suggests that students highly value teachers who bring a genuine passion and commitment to their teaching profession. The statistic indicating that 76.9 percent of students to the statement 7 believe Teachers should be versatile highlights the importance of adaptability, creativity, and flexibility in the teaching profession. To the statement 8, Teachers to connect with their students the overwhelming majority of 95.6 percent of students emphasizes the significance of interpersonal relationships in the educational setting. We can see that 93 percent of students to the statement 9 believe Teachers should inspire their students to take responsibility for their own learning process. Finally, from the above statistics, we can see that 89.8 percent of students to the statement 10 believe Teachers should constantly work on *improving their teaching skills.* 

Based on the students' responses, the results of the questionnaire can be summarized in three levels of importance: First, effective communication is highly associated with good English language teachers. Over 90% of respondents cited clear and concise communication as a crucial quality of good English language teachers. They emphasized the ability of the teacher to explain complex concepts in a simple and understandable manner; 85% of respondents believed that a good teacher must exhibit patience and empathy towards students, particularly those who may struggle with language learning; Approximately 80% of respondents stated that a genuine passion for teaching and a love for the English language are vital qualities; More than 75% highlighted the importance of adaptability, where teachers can modify their teaching methods to suit different learning styles and proficiency levels; Around 70% emphasized the need for cultural sensitivity and intercultural competence, recognizing the diverse backgrounds of learners. Second, qualities of moderate importance - Subject Knowledge: About 65% of respondents rated subject knowledge as a moderately important quality; Organizational Skills: Approximately 60% felt that organizational skills, including lesson planning and classroom management, were of moderate importance. Third, qualities of lower priority – Technological Proficiency: Only 45% considered technological proficiency as a key quality, indicating that it's less essential but still relevant; Experience: Surprisingly, respondents ranked years of teaching experience as relatively unimportant (40%). From the results of the student questionnaire, it is worth noting that there were variations in responses among students which reflect the diverse opinions on the qualities that define a good English language teacher and highlight the need for educators to possess a multifaceted skill set to meet the varied expectations of their students and peers.

#### Analysis of Teacher /Interviews

10 English language teachers from early career to experienced were interviewed to know their own perception of the qualities of good English language teachers. Interviews were audio recorded and some of the transcripts of the selected reflections are presented under each of the questions.

1. How do you create a supportive and inclusive learning environment for English language learners of diverse backgrounds and proficiency levels?

"I believe in fostering a supportive and inclusive learning environment, so I am interested to know my students individually, understanding their cultural backgrounds, language experiences, and learning preferences. In this way, I design my teaching approach."

"I encourage students to share their personal experiences, cultural traditions, and language skills, creating opportunities for cross-cultural exchange and enrichment."

2. As a language teacher, how you incorporate language proficiency goals into your curriculum?

"I include task-based learning activities into my curriculum to help language proficiency. These tasks are designed to simulate real-life communication situations, encouraging students to use the language in meaningful contexts."

"I use a variety of assessment tools, including quizzes, tests, presentations, and projects, to evaluate different aspects of language proficiency."

3. How do you ensure clarity and comprehensibility in your instructions and explanations, especially for learners with varying levels of English proficiency?

"I provide clear and concise explanations, supported by visual aids, examples, and demonstrations to enhance comprehensibility."

"By catering to individual learning styles and preferences, I promote clarity and comprehension among all learners."

"I integrate visual aids, multimedia resources, and real-life examples into my instructions and explanations. Visuals can help clarify concepts, reinforce key vocabulary, and provide context for learners who may struggle with English proficiency."

4. How do you collaborate with other teachers to support English language learners' academic and linguistic development?

"By regularly monitoring students' progress and discussing their individual needs, we can tailor instruction and intervention strategies to support their academic and linguistic development effectively."

"By building positive relationships with families and fostering open communication, we can gain valuable insights into students' cultural backgrounds, language experiences, and home environments."

5. How do you engage in self-reflection and seek feedback to continuously improve your teaching effectiveness and student outcomes?

"By inviting peers to observe my teaching and provide constructive feedback, I gain valuable insights into my instructional practices and areas of strength and weakness."

"By incorporating student feedback and assessment data into my reflective practice, I can make evidence-based decisions to improve teaching effectiveness and promote positive student outcomes."

6. Can you describe a successful language learning experience you facilitated in your classroom?

"I facilitated "Language Café" sessions which were highly effective in fostering authentic communication and camaraderie among students, resulting in noticeable improvements in their oral proficiency over time."

"A successful language learning experience I facilitated involved integrating digital storytelling projects into the curriculum. Students were tasked with creating digital stories using multimedia tools such as video editing software, digital storytelling apps, or online platforms."

7. How do you establish and maintain discipline while promoting a positive and respectful classroom culture?

"I actively promote positive behavior through praise, encouragement, and reinforcement. I recognize and celebrate students' efforts, achievements, and contributions to the classroom community."

"I take the time to get to know each student as an individual, showing genuine interest in their interests, strengths, and challenges."

"I foster a culture of respect, responsibility, and cooperation, which contributes to a positive classroom environment."

8. What do you believe are the most important qualities or characteristics of a good English language teacher, and how do you embody these qualities in your teaching practice?

"A great teacher has good classroom management skills and can ensure good student behavior, effective study and work habits, and an overall sense of respect in the classroom," a senior language teacher said."

One of the senior most teacher said, "A good teacher is always passionate about his/her teaching and working with students. Such teachers truly influence students' learning and also are mindful of the impact they create in students' lives."

An English language teacher in his early career believes that "A great language teacher should develop a strong rapport with his or her students with his winning personality and style."

#### **Observation of Classroom Teaching**

English language classroom teaching observation offered valuable insights in understanding not only the nature and personality of teachers but also some aspects of the learner behaviour and their learning processes. First, observing language teachers in action helped us in gaining firsthand experience of various aspects such as teaching strategies, instructional techniques, and classroom management methods. Next, we could observe and witness how English language teachers encouraged learning, provided feedback, and created a supportive learning environment conducive to English language learning. Most importantly, from the classroom observation it is evident that language teaching is an opportunity for teachers to reflect on their teaching approaches, assess their strengths and areas for improvement, and engage in professional development activities tailored to their specific needs.

#### **Student-Feedback of Teacher and Teaching Practices**

Analysis of student-feedback helped the researchers to gain a deeper understanding of teaching effectiveness, instructional methods, and classroom dynamics. Students' perspectives and assessment offered insights into aspects such as: clarity of instruction, engagement level, relevance of materials, and overall learning experience. Analyzing student feedback has also helped us to identify areas of strength and areas for improvement of teaching practices. As per the administrators' opinion, student-feedback always played a key role in understanding a culture of transparency and accountability in education, empowering students to voice their opinions and contribute to enhancement of teaching practices, improving the quality of education, and promoting student success.

#### **Implications for English Language Teachers**

The study offers some key implications for English language teachers:

- English language teachers should prioritize ongoing professional development to enhance their pedagogical skills by attending workshops, conferences, and training programs that focus on effective communication, adaptability, and cultural sensitivity.
- Teachers must continually work on improving their communication skills using clear and concise language, active listening, and the ability to provide constructive feedback.
- Recognizing the importance of empathy and patience, English language teachers should strive to create a supportive and nurturing learning environment, especially for students who may find English language learning quite a challenging experience.
- English language teachers should have enthusiasm and cultivate a genuine passion for English language teaching which will significantly enhance the classroom experience.

#### Conclusion

The qualities that define a good English language teacher encompass a multifaceted blend of pedagogical expertise, interpersonal skills, cultural sensitivity, and a passion for teaching. This research has underscored the intricate nature of effective language instruction, with a diverse range of stakeholders emphasizing various qualities. English language teachers must recognize the importance of these qualities and continuously strive for professional growth. The insights gleaned from this research contribute to the advancement of language education, benefiting both teachers and students and ensuring a brighter future for English language learning.

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#### Using Online Resources in Teaching Arabic as a Second Language in Non-Arab Countries

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> The Barcelona Conference on Education 2024 Official Conference Proceedings

#### Abstract

The forms and methods of education are closely related to the primary sources and forms of information transmission because information transmission is also one of the most essential components of knowledge transmission. During the last decade, when the Internet and online technologies and platforms have become available to almost everyone, they have actively penetrated the educational system, providing wider opportunities to make the educational process more continuous, diverse, and sometimes less tedious. In the case of teaching a foreign language, they also offer a chance to overcome the negative consequences arising from the lack of the target language environment and, at least, to minimize that. The main topic of this paper is the effective use of online platforms in the classroom and beyond, combining them with traditional textbooks and other educational materials in the context of guiding students' independent work. The paper seeks to highlight this problem by answering the following questions:

- Which online resources are the most effective, which resource is preferable to use in the classroom, which is for outside of the school, and what percentage of the classroom time should not exceed the use of such resources?

- What skills are these resources aimed at developing?

- What types of resources are preferable to use to develop specific skills in interactive and non-interactive skills development?

The problems mentioned above are addressed in the paper from the angle of teaching Arabic as a second language in non-Arab countries, considering the teaching of literary Arabic and its dialects.

Keywords: Education Methods, Online Resources, Foreign Language Teaching, Teaching Resources, Arabic Language Instruction

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#### Introduction

We came up with the following triangle to present any planning process that consists of a clear goal, resource(s), and tool(s) or method(s) by which these resources will be used to achieve the goal:



In the case of language learning, the goal is for the learner to master the language at one level or another, for the implementation of which learning materials (resources) are needed, and a method that will help turn the resource into knowledge:



Each lesson can be made up of several such triangles depending on the specific goal(s) it pursues.

For example, suppose the goal of the class is to explain or familiarize the students with the past tense verb of the Levantine Arabic dialect. In that case, several resources can be used, like textbooks, video lessons, oral conversations, etc. This can be delivered using various methods, such as structural, audio-lingual, and communicative methods.



It is important to note that it is essential to choose the right resources to achieve the goal of each class or lesson in the shortest possible time and with maximum benefit. This must be applied through the use of the appropriate method that will facilitate the process and make cohesion between all three factors.

During the last decade, the Internet and online technologies and platforms have become available to almost everyone; online resources have become an inevitable part of educational resources that are used in formal or informal settings.

This presentation will highlight the use of online resources in teaching a second or foreign language, taking Arabic as an example in an environment where Arabic is considered a foreign language.

The following sections are a brief literature review followed by a discussion that tries to answer several questions we raised.

#### Literature Review

Being a difficult language, having diglossia and complex grammar, Arabic is a language with challenges for non-native speakers (Abu-Haidar, 1996). Therefore, finding alternatives such as online resources, including multimedia methods, facilitates the learning process for both the instructor and the learners.

Moreover, teaching a language without emphasizing its culture is difficult. Teachers of Arabic teach the cultural part differently based on their experiences as learners of that language themselves, and according to the training they persuaded and with the transfer of the culture from their direct contact with the target language (Kovács, 2017). For this reason, it is inevitable to use online resources to teach the cultural context of a certain language as a part of the language class.

The rapid growth of technology and the widespread use of the internet have transformed the learning process, allowing students to gain knowledge in new ways. Online resources, including language teaching websites, mobile applications, and other several language teaching interactive platforms, provide flexibility by allowing language learners to access content at their convenience and tailor their learning to their own learning style with or without the supervision of the instructor (Haleem et al., 2022; Huda et al., 2023).

Web resources allow non-native language learners to communicate with native speakers continuously, up to 24 hours a day. This, in turn, allows the learner to engage in an ongoing process of actively using a foreign language and gives them the freedom to select the type, time, and location of their training, as well as a native speaker teacher, based on their individual needs. The importance of the didactic potential of the internet is highlighted as a tool for meeting linguistic and educational goals for all stakeholders of the learning process. The role of the teacher becomes a facilitator of the process and one of the tools the teacher uses in foreign language settings (Nizamove, 2021).

#### Discussion

In terms of foreign language teaching resources, online resources may be irreplaceable today. Over the past decade, with access to technology and Internet access, it has been difficult to imagine teaching a language without using Internet resources, especially in environments where a language is taught as a foreign language. Being a massive open source, the Internet is not subject to clear regulations. Therefore, it is important to use the right tools and methods to select literate sources and use them correctly and as efficiently as possible so as not to waste time in vain.

At the university level, the case of this study is teaching Arabic in a non-Arabic speaking environment, particularly in the experience of foreign institutions, where Arabic teaching begins at a zero level. This paper is not intended to present all available resources, which is essentially impossible. We aim to classify resources and answer the following questions:

- What types of online resources are used in teaching/learning languages?
- What is the purpose of using online resources in language teaching?
- How to choose a resource?
- Which resources should be offered to students in class, and which should be used as self-paced homework?
- What should the ratio of online resource use during a class be?
- What linguistic skills are most active as a result of the use of online resources?

#### Q1: What types of online resources are used in teaching/learning languages?

The online resources used in language teaching are numerous and huge in variety.

Below, we classified them into three main categories:

- 1. Resources suggested to be used by teachers:
  - Resources designed for teachers they consist of lesson plans or methodologies for working on specific textbooks, such as the Al-Kitaab Arabic Language Program.<sup>1</sup>
  - Resources that do not have language activities on their own and are used merely as an assisting resource. For example, 360stories.com,<sup>2</sup> 360cities.net,<sup>3</sup> earth.google.com.
- 2. Resources for Students

Resources that present complete lessons of their own and with which the learner can learn independently without a teacher. Some of them are:

- Online versions of textbooks such as Leipzig University Modern Standard Arabic,<sup>4</sup> Madinah Arabic.<sup>5</sup>
- Online courses with certificates, including language courses through global online learning platforms that offer online courses with certificates from leading universities and institutions. Like Coursera,<sup>6</sup> Khan Academy,<sup>7</sup> and Udemy.<sup>8</sup>
- Non-formal platforms that offer structured courses and interactive exercises. Websites like Online Arabic,<sup>9</sup> Learning Arabic,<sup>10</sup> Learn Arabic Online Videos,<sup>11</sup> SpeakArabic: Advancing Arabic as a Global Language,<sup>12</sup> Busuu,<sup>13</sup> and applications like Duolingo, Mango, and Memrise.
- Platforms for language practice offered on social media networks

<sup>&</sup>lt;sup>1</sup> Al-Kitaab Arabic Language Program. https://alkitaabtextbook.com/teachers/teaching-resources

<sup>&</sup>lt;sup>2</sup> For example: Museum of Islamic Art in Doha https://360stories.com/qatar/place/museum-of-islamic-art

<sup>&</sup>lt;sup>3</sup> For example: Museum of future in Dubai https://www.360cities.net/image/museum-of-the-future-ii

<sup>&</sup>lt;sup>4</sup> Modern Standard Arabic. https://modern-standard-arabic.net/en

<sup>&</sup>lt;sup>5</sup> Madinah Arabic. https://www.madinaharabic.com

<sup>&</sup>lt;sup>6</sup> Coursera. https://www.coursera.org

<sup>&</sup>lt;sup>7</sup> Khanacademy. https://www.khanacademy.org

<sup>&</sup>lt;sup>8</sup> Udemy. https://www.udemy.com

<sup>&</sup>lt;sup>9</sup> Arabiconline. https://arabiconline.eu/first-steps-arabic

<sup>&</sup>lt;sup>10</sup> Learning Arabic. https://learning.aljazeera.net/ar

<sup>&</sup>lt;sup>11</sup> Master Arabic with real-world videos. https://playaling.com

<sup>&</sup>lt;sup>12</sup> Teach, Learn, And Speak Arabic: Advancing Arabic as a Global Language. https://www.qfi.org

<sup>&</sup>lt;sup>13</sup> Busuu. https://www.busuu.com

- 3. Resources for teachers and students
  - Platforms allow a teacher to create classes or use the lessons created by other teachers, and students can use these lessons with and without the help of a teacher. Some of these provide a wider range of opportunities for making fully-equipped classes, such as nearpod.com, kahoot.com, quizlet.com, and other platforms aimed at Games and activities, like flashcards,<sup>14</sup> and vocabulary related activities.<sup>15</sup>
  - Resources that are not complete courses for independent language learning, but contain video lessons on specific topics.
  - Resources that are not designed for an educational purpose, but can be used in language learning. They are divided into the following two groups:
    - Audio and video resources: songs, movies, vlogs, podcasts, reels, news sites, digital radio and television.
    - Websites providing various services, dictionaries, corpora, for example reverso.net, almaany.com, various concordances for the development of writing skills.

#### Q2: What is the purpose of using online resources in language learning?

The use of resources during lessons can pursue a number of, including highly individual, goals. We highlight the main ones.

- They make the lesson more interesting and diverse: Of course, the lesson can be diverse without using online resources, but considering youth's connection to the internet in their daily interactions, online resources provide greater opportunities for interesting and attractive learning settings. It does so by speeding up many processes and getting over the traditional old tools previously used.
- They promote students' extracurricular independent work: The purpose of using online resources should be to teach a language in the classroom, prepare the student outside the classroom, and continue learning the language independently. Therefore, students need to know the resources most useful for them.
- They compensate for the lack of a language-bearing environment: In addition to the teacher's pronunciation, the students listen to the pronunciation of many other people, mainly native speakers, and not only professionals, but also ordinary people who may also have language defects, which happens when students are in the environment of native speakers.

#### Q3: How to choose a resource?

The following criteria are important for selecting resources appropriate to the objectives of a language course:

- Compliance of the resource with the required standards; in the case of teaching Arabic, it is first of all the correspondence to the taught version of the language (literary language or any of the dialects, or the combination of more than one version, depending on the taught material), the degree of literacy, etc.
- It should also be noted that the selected resources may contain certain errors, but in that case, depending on the purpose of the taught material, these errors are used as a

<sup>&</sup>lt;sup>14</sup> Studystack: Arabic Flashcards. https://www.studystack.com/arabic

<sup>&</sup>lt;sup>15</sup> Wordwall: Create better lessons quicker. https://wordwall.net/ar

teaching tool, drawing special attention to them, performing additional tasks, or using them in order to enhance the grammar rules.

- The degree of complexity should be appropriate to the language level of the students, it is desirable that the unfamiliar vocabulary does not exceed the accepted percentage.
- Compliance with academic standards

# Q4: Which resources to offer for students in-class and which to use as self-paced homework?

The resources are separated in two points of our classification: resources only for lecturers and resources for lecturers and students are mainly used in the classroom, but they can also be assigned as homework, and in the first case, the task must be clearly formulated by the lecturer. For example, for descriptions of places posted on 360stories.com, students are given the main points to talk about in their description. It is desirable not to have a translation for the material used in the classroom for this activity so that the student can focus on the target language and try to use the context to guess the meaning of unfamiliar words which also contributes to the development of the student's linguistic thinking in the target language. Not having translation creates an additional opportunity to explain new vocabulary in the target language.

As for online resources used for homework, they may have a translation or additional comments in the intermediate language. In this sense, the choice of resource depends on the objectives of the given task.

Long movies and series can be used both in-class and out of it. Outside the classroom, they are used to perform several tasks, in particular, to pre-watch the movie for discussion in the classroom (it should be noted that for such a discussion it is desirable to prepare questions in advance so that the discussion is more meaningful and detailed), watching the movie, writing out the most frequently encountered vocabulary, or trying to guess unfamiliar words and write their explanation in the target language, etc. Moreover, depending on the level of the student's language knowledge, one can choose movies and TV series that have subtitles in a language familiar to the student or in the target language.

#### Q5: What should be the ratio of online resource use during a class?

The online resources are a component of the course and lessons, but the portion of using online resources should not be a whole lesson or a chapter. There should be a reasonable balance between using online sources and other materials.

In our opinion, the desired ratio is 1 to 2, in which case every 20 minutes of using the online resource is followed by 40 minutes of practicing the content gained during that time and active analysis and application of the vocabulary.

#### Q6: What linguistic skills are most active as a result of the use of online resources?

This depends on the type of resource because all four language skills can be developed through the use of different types of resources. It is important to logically connect the opportunities provided by the resource with the development of a certain skill.

In the following, we will discuss what online resources enhance each linguistic skill:

#### **Online resources that enhance the listening skill:**

The use of online resources is indispensable for developing listening skills in the first place because, when the language is taught as a foreign language, online media resources are perhaps the only way to create diversity for this skill in the classroom. The development of listening skills, in turn, contributes to the development of the ability to speak, because listening enables learners to reproduce vocabulary and phrases more easily in a similar situation.

As a result, the student gains greater self-confidence and ease. However, in order to make the obtained result more lasting, the lecturer should once again pay attention to these words and expressions in the classroom, record the situations in which they are used and create as many similar situations as possible so that the students can apply what they have already learned.

#### **Online resources that enhance the speaking skills:**

Online resources can be used to develop the speaking skill, and we are classifying them as the following:

- Materials for further replication (for levels A1 and A2), for example, simple dialogues, short texts, or stories representing different life situations, which students are able to paraphrase by telling about their daily life, or reproducing similar dialogues.
- Materials for further discussions (for B1 and higher levels). Those can be documentaries, feature movies, series, short stories, and various educational materials.
- Special programs on separate topics, based on which students can prepare their own material and present it to their classmates.
- Pictures or short films without texts that students can turn into stories.

#### **Online resources that enhance the reading skill:**

Arabic is a language of the Semitic languages family and has a discontinuous morphology, based mainly on the concept of a root consisting of three consonants. Words are derived from the root through internal inflection and internal vocalic patterns that are used to indicate grammatical processes. There are three main elements in Arabic vocabulary: the root, the vowel, and the auxiliaries: prefixes, suffixes, and inflections. The Arabic script is consonantal, accompanied by diacritical marks, which include short vowels used above or below letters to indicate correct pronunciation and grammatical categories.

Although vowels indicate grammatical categories, the short vowels are absent from authentic texts, while in materials prepared for educational purposes, they are often placed.

Therefore, Arabic orthography is considered deep if it is not vowelized but shallow if it is vowelized. The deep orthography needs a good knowledge of grammatical categories and lexical norms; otherwise it is impossible not only to understand the text, but also to read it correctly. For this, from the very first stage, it is necessary to gradually teach students to read the unvoiced text correctly, which can be helped by the online resources that provide the unvoiced text with parallel literate reading, so that students can try to read independently and check themselves with the attached recording.

#### **Online resources that enhance the writing skill:**

The use of online resources can also significantly contribute to the development of writing skills in teaching a foreign language, such as Arabic. Starting from letters to learning to write at different levels and developing what has already been learned. Various phone applications, websites, and other online platforms help not only to learn the Arabic alphabet, but also to write in different Arabic scripts.

Learners at higher levels are able to check spelling, use a large number of video lessons that explain various grammar structures and rules, and gain access to a large variety of texts that can act as models for creating similar texts on their own, as well as develop writing skills through reading a wide range of content. Additionally, various forums are also important, where native speakers help to write competent texts.

#### Conclusion

As the teaching experience showed, it is inevitable to achieve the goals of language classes without the use of online tools and resources. The abovementioned showed the advantages and benefits online resources have in a foreign language teaching class setting. Thus, using the appropriate resources makes the class more interesting for the learners of the 21st century and helps the teachers to meet their objectives.

Using various online resources in foreign language classes is useful from another point of view. It enables the student to deal with the language in its natural, authentic state, with mistakes, slang expressions, and jargon language which are absent in classical language textbooks.

It prepares the student for authentic communication with the target language. In this context, it is very important to teach students to critically approach various resources, and distinguish between useful and less useful, or perhaps not useful ones.

The use of online resources in the teaching process should have clear purposes in themselves. With all the advantages listed, using online resources does not take less effort from the lecturer to deliver the classes as their application must be associated with specific tasks that must be completed either during or as a result of their application. It is desirable that the tasks be multiple and, in the end, give an opportunity to use the words and phrases used in the resources independently of the given resource, also in a different context.

Every time after using new resources, it is necessary to reflect on how well they served their purpose, whether there is a need to change or adjust each resource, and assess how time was spent on each resource and whether they were effective and therefore, their use was justified. Lastly, it is very helpful to have online resources as a tool in language classes as discussed in this paper. However, they do not replace the role of the lecturer who chooses, adapts, and adjusts each resource so they facilitate the learning process.

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#### Formative Assessment Practices of Middle School Mathematics Teachers in the Dominican Republic

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#### Abstract

This descriptive phenomenology study investigated middle school mathematics teachers' formative assessment practices in the Dominican Republic. The study explored three research questions about the types of formative assessment strategies teachers implemented, how they used formative assessment data to make instructional decisions, and the challenges they faced implementing these strategies. Eighteen middle school mathematics teachers from public and private schools in three southern cities took part in the study. The data collection consisted of semi structured interviews, focus interviews, and reviews of mathematics lessons. The findings of this investigation showed that teachers implemented various formative assessment strategies and took an active role in the process. Thus, teachers rarely engaged students in peer assessment, self-assessment, collaborative work, and other methods that promote students' ownership of the learning process. While some teachers used formative assessment data to adjust instruction, others used the data to provide academic intervention to students or assign a grade. Finally, teachers experienced contextual and personal challenges implementing formative assessment, such as students' limited skills in mathematics and motivation, large class sizes, limited resources, and time to plan and implement formative assessment. Contextual factors relating to students' current performance and motivation were the most usual challenges reported by teachers.

Keywords: Formative Assessment, Assessment for Learning, Feedback

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#### Introduction

#### **Formative Assessment in Mathematics**

Researchers have found five critical formative assessment strategies that positively affect mathematics instruction and student learning (Bennett, 2011; Leahy et al., 2005; Oswalt, 2013; William & Thompson, 2008). When using effective formative strategies in mathematics, teachers should (a) clarify and share learning progressions and success criteria, (b) create effective classroom discussions (questions and learning tasks), (c) provide feedback to improve student outcomes, (d) create opportunities for students to be owners of their learning by engaging them in self-assessment, (e) activate students as instructional resources for one another through peer and self- assessment (Silver & Mills, 2018). Peer and self-assessment in mathematics provide students with opportunities to assess their knowledge, reflect, and improve the quality of their learning (Michael-Chrysanthou & Gagases, 2014; Swan & Foster, 2018). Furthermore, mathematics teachers should collect evidence of student learning to make instructional adjustments, assess the appropriateness of curriculum, and establish goals for students (Siegel & Wasser, 2011; Veldhuis & Van den Heuvel-Oppenhuizen, 2020).

Formative assessment in mathematics varies. Curriculum-embedded formative assessments are often included at different points in the curriculum sequence to assess students' mastery of the standards (Cizek et al., 2019; Heritage, 2008; Shavelson et al., 2008). These assessments provide teachers with feedback on students' readiness, inform the teacher of students' current performance, and address any learning needs to help teachers provide timely feedback (Shavelson et al., 2008). On the other hand, informal formative assessment can be any classroom interaction between teachers and students. These assessments may occur anytime during instruction and involve the whole class, small groups, or individual interactions (Ruiz-Primo, 2011). Informal formative assessments could be spontaneous and provide the teacher with information about a student's current level of understanding. While conducting these assessments, the teacher can address students' misconceptions and make immediate adjustments (Cizek et al., 2019).

#### **Teachers' Beliefs of Formative Assessment**

Several factors influence teachers' implementation of formative assessment. First, teachers' beliefs and attitudes influence the adoption of formative assessment (Clark, 2012; Coffey et al., 2011; Harrison, 2013; Heitink et al., 2016; Johnson et al., 2019). Teachers' positive beliefs of the usefulness and higher self-efficacy of formative assessment are positively related to the implementation of formative assessment (Karaman & Sahin, 2017; Yan & Cheng, 2015), while a lack of confidence will result in less implementation of formative assessment (Crichton & McDaid, 2016). Second, teacher's content and pedagogical knowledge impact the may hinder or promote the implementation of formative assessment (Heitink et al., 2016; Polizzi et al., 2015; Yin & Buck, 2019). Thus, targeted professional learning can positively impact the adoption of formative assessment (Rashid & Jaidin, 2014, Wyllie & Lyon, 2015 and limited training or professional development can be barriers for teachers to implement formative assessment (Poole, 2016; Vlachou, 2015). Third, school policies such as guidance on formative assessment (Elwood, 2006; Torrance, 2012; Van der Kleij et al., 2018), structures that support teachers' collaboration (Butt, 2010; Jones & Moreland, 2005; Leahy et al., 2005; McMillan, 2003) and standardized assessment and accountability can influence teachers' integration of formative assessment in instruction (Box et al., 2015; Yan & Brown,

2021; Yin & Buck, 2019) and class size can influence teachers' use of formative assessment (Alotaibi, 2019; Asare & Afriyie, 2023; Chin & Wong, 2013) and limited resources can hinder teachers' implementation of formative assessment (Alotaibi, 2019; Black & Wiliam, 2004; Halai et al., 2018).

#### **Research Questions**

Research Question One: What types of formative assessments do middle school mathematics teachers implement?

Research Question Two: What instructional decisions do middle school mathematics teachers make with data collected from formative assessment?

Research Question Three: What challenges do middle school mathematics teachers report implementing formative assessment?

#### Conclusions

Research Question One: What types of formative assessment do mathematics teachers use in their classrooms?

Based on the data collected, the teachers implemented a variety of formative assessment in their classrooms. First, ten (55%) teachers reported using questioning to check students' understanding, assess prior knowledge, and engage students in metacognition. Second, six (33%) teachers used observation as formative assessment strategy. In addition to questioning, four (22%) teachers reported using strategies to activate students' prior knowledge and review earlier content. Five (28%) teachers reported using practice problems as a formative assessment strategy. Eight (44%) teachers reported using practice problems as a formative assessment strategy. Four (22%) teachers reported using peer assessment during individual interviews. The teachers described how they used student monitors; these were student leaders in the group who worked as teacher "assistants. Moreover, teachers reported using peer-assessment strategies when they sent students to the board to complete practice problems. Six (33%) teachers reported sending students to the board regularly.

Research Question Two: What changes do teachers make from the formative assessment data collected?

During the individual interviews, seven (39%) teachers described using data from formative assessment to inform instruction. Teachers made on-the-spot adjustments while teaching. In addition, seven (39%) teachers reported using formative assessment to differentiate instruction and provide students with individualized support. a lesson not part of the curriculum. Three (17%) teachers described using formative assessment data to show students needing academic intervention in and outside the classroom. While some teachers provided students with individualized support during the lesson, other teachers involved the school administration and referred students for additional support. In addition, three (17%) teachers reported assigning grades to students from formative assessment learning tasks.

Research Question Three: What challenges do teachers face implementing formative assessment?

Five (28%) teachers reported students' lack of motivation for learning mathematics as a challenge for implementing formative assessment. This finding is consistent with research that has found that students' poor attitudes, excessive absenteeism, and mindsets can discourage teachers from implementing formative assessment (Remesal, 2007). Five (28%) teachers reported students' limited mathematics ability as a challenge. Furthermore, four (22%) teachers reported large class sizes as a challenge. Finally, **four** (22%) teachers mentioned that the unavailability of resources made it difficult to use different strategies for formative evaluation.

There are various implications of the findings of this research. First, there is a need for the creation of professional plans to support the implementation for formative assessment in mathematics. The plan could incorporate a variety of learning experiences such as workshops, coaching, inter-visitations, and lesson study. Teachers' pedagogical and content knowledge impact implementation of formative assessment (Heritage, 2007; Jones & Moreland, 2005). Collaborative structures such as professional learning communities have a positive impact on teachers' implementation of formative assessment (Butt, 2010; Gioka, 2009). Teachers' participation in professional learning has a positive impact in the adoption of formative assessment (Akayuure, 2021; Ramollo & Kanjee, 2023). Second, teachers should be provided with materials and supplies to implement formative assessment (Black & William, 2004; Dufresne et al., 2011). Third, workload. As a result, these teachers spent considerable time planning for their classes. Heavy workloads and large class sizes negatively affect teachers' implementation of formative assessment (Alotaibi, 2019; Asare & Afriyie, 2023).

#### Limitations

There were several limitations of this investigation. First, the sample size and setting of the study. The sample population consisted of 18 middle school mathematics teachers in seventh, eighth, and ninth grade from 16 schools. Second, the country's mathematics curriculum and instructional approaches might differ from those in other settings. These factors could limit the generalization of this study's findings (Polit & Beck, 2010; Treharne & Riggs, 2015). Third, teachers could have embellished their responses or provided inaccurate responses to the research questions. Finally, the data collection did not include classroom observations or analysis of student work. This type of data could have contributed to a more comprehensive understanding of teachers' formative assessment practices.

#### Recommendations

The findings of this study contributed to a gap in research about formative assessment practices in mathematics in the Dominican Republic. Future research could investigate teachers' formative assessment literacy and beliefs. Teachers' understanding and beliefs about formative assessment impact their integration of formative assessment (Harrison, 2013; Johnson et al., 2019). Additionally, preservice mathematics teachers' formative assessment could strengthen teachers' preparation programs and the implementation of formative assessment (Lachapell Maldonado, 2017; Morales-Lopez, 2017). Finally, other studies could explore the impact of specific formative assessment practices on student achievement, motivation, and attitude toward mathematics (Bennett, 2011; Leahy et al., 2005; Oswalt, 2013; William &Thompson, 2008).

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#### Issues With Midwife-Obstetrician Collaborations: An Analysis of Three Medical Malpractice Cases

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#### Abstract

Purpose: Midwives and obstetricians are involved in making critical decisions regarding the safety of both the mother and child; hence, an adequate collaboration between them is imperative. This study aimed to identify issues in midwife-obstetrician collaborations by examining three representative perinatal medical malpractice court cases between 1999 and 2021. In Japan, researching judicial decisions is considered literature research; therefore, an ethical review was not necessary.

Methods: A legal database was comprehensively searched using keywords "medical accident" and/or "childbirth," yielding 122 relevant cases, of which three were selected based on specific criteria. Three cases were selected from this pool for the present study. The selection criteria focused on cases where plaintiffs prevailed and where collaboration between midwives and obstetricians played a significant role.

Results: In Case 1, the midwife's prompt recognition of potential risks and the implementation of preventive measures were deemed necessary. Case 2 highlights the importance of practical skills and decision-making. Regular training of midwives during neonatal resuscitation is crucial. Case 3 emphasizes the midwife's role in independently monitoring the fetal heart rate and accurately interpreting the readings, encouraging exercising judgment and taking appropriate action.

Conclusion: This study emphasizes the need for midwives and obstetricians to leverage their respective expertise, maintain constant communication, and collaborate to provide optimal care and prevent medical accidents. Recognizing problems with such collaborations and addressing them in postgraduate education is essential.

Keywords: Collaboration, Midwife, Malpractice, Resuscitation, Obstetrician, Patient Care Team

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#### Introduction

Approximately 38,000 midwives are employed in Japan across various settings, including hospitals, clinics, and midwifery centers (Ministry of Health, Labour and Welfare, 2022). A midwife's role includes monitoring the progress of the delivery appropriately and providing accurate advice to pregnant women when necessary. They also contribute to the overall health support of mothers and children by ensuring a safe birthing environment and remaining actively involved in postpartum care. These advanced midwifery practices, which emphasize the autonomy of midwives, are recognized as crucial care standards globally (World Health Organization, 2016). Additionally, inter-professional collaboration is crucial because of the potential unforeseen risks associated with childbirth (Romijn et al., 2018). The collaboration of midwives with obstetricians is especially important, as midwives and obstetricians work together to make the necessary decisions that prioritize the safety of both the mother and child. Midwives and obstetricians are obliged to provide care based on their professional knowledge and skills, as well as to fulfill their responsibilities according to their respective roles (Ishibiki et al., 2013). Conversely, inadequate collaboration between them can cause adverse effects (Leonard et al., 2004; Manser, 2009). Cases in medical practice have been reported in which this collaboration has been problematic, highlighting the need for improved collaboration and communication among healthcare professionals (Berglund et al., 2008; Weller et al., 2014; Eggermont, 2015). Professional rivalries and philosophical differences in childbirth practices generate significant tension in clinical settings (Behruzi, 2017). Some surveys mention power imbalances, a lack of trust, and mutual acquaintances as causes (Van et al., 2016). Midwives, in collaboration with obstetricians, can provide continuous care to women experiencing complications during pregnancy and/or childbirth (Skinner et al., 2010). A positive and open relationship that fosters frank discussions is deemed crucial for effective collaboration between midwives and obstetricians (Schmiedhofer et al., 2021). However, there is a notable dearth of research investigating strategies to facilitate collaboration between the two professions (Manser, 2009; Adeyemo et al., 2022). and satisfaction with collaboration with other obstetric care providers (Warmelink et al., 2017). Limited evidence hinders the development of best practices and guidelines to promote successful partnerships between midwives and obstetricians. Further research is needed to explore and identify effective approaches, communication techniques, and interventions to enhance collaboration and teamwork between midwives and obstetricians. Particularly, there is a scarcity of studies that have thoroughly analyzed the underlying factors contributing to inadequate collaboration between midwives and obstetricians, which often leads to medical errors. Furthermore, research exploring practical measures to prevent the recurrence of such errors is lacking.

Therefore, this study aimed to investigate the issues with collaboration between midwives and obstetricians using three representative medical malpractice court cases in which collaboration between the two professions was questioned. By leveraging these findings, this study seeks to contribute to the prevention of medical errors and adverse events by reducing the associated risks and improving collaborative practices between midwives and obstetricians. The issues identified in this study are relevant and useful in modern healthcare practices.

#### Methods

In Japan, researching judicial decisions is considered literature research; therefore, informed consent is exempted (as stated in Article 82 of the Constitution: Public access to court proceedings, Article 91 of the Code of Civil Procedure: Inspection of case records, Article 13 of the Copyright Act: Works that are not the subject of rights, etc.). Ethical considerations

ensured the privacy and confidentiality of the individuals and medical facilities included in this study. Moreover, descriptions that could potentially identify individuals or specific medical institutions were deliberately avoided when citing court cases. As this study is a literature review, an ethical review was not necessary.

This study involved the collection and analysis of perinatal medical malpractice court cases from 1999 to 2021 using a legal database (TKC Law Library, 2022). This approach can be considered a form of literature review wherein the cases serve as valuable sources of information. The chosen timeframe of approximately 20 years is significant because of Japan's focus on enhancing medical safety measures during this period, driven by a history of similar recurring incidents.

From April to December 2020, a comprehensive search was conducted using the keywords "medical accident" and/or "childbirth" to identify 122 relevant court cases. Three cases were selected from this pool for the present study. The selection criteria focused on cases where plaintiffs prevailed and where collaboration between midwives and obstetricians played a significant role. However, the following cases were excluded: those where the primary fault of medical malpractice was attributed to the individual judgment of a midwife or physician and those where it was impossible to examine the issue with collaboration between both parties unless the fault was rectified.

The three cases were chosen because they presented clear and well-documented actions of the midwives and circumstances in chronological order, allowing detailed analysis and examination. The analysis method involved organizing the identified issues, studying the arguments presented by the parties involved, and determining the background information of the cases. Organization was achieved by utilizing a medical progress chart prepared in chronological order following the guidelines outlined (Supreme Court of Japan, 2007). The chronological arrangement of the chart allowed a systematic examination of the case details, facilitating a comprehensive analysis of the issues at hand. In conducting the case review, utmost efforts were made to maintain objectivity. This involved a comprehensive evaluation of the scientific basis, evidence, testimonies, and statements presented by the parties involved in the trial. Three experts supervised the review process to ensure the validity of the analysis, thereby contributing to a rigorous and well-informed assessment.

#### **Operational Definitions of Terms**

#### **Collaboration Between Midwives and Obstetricians**

This refers to the cooperative and coordinated efforts between a midwife and an obstetrician, working together towards the shared objective of reducing the incidence of medical errors and adverse events in obstetric care. The goal of this collaborative approach is to ensure the safety and well-being of both the mother and child by leveraging each professional's unique expertise and skills.

#### Results

#### Case 1 (Tokyo District Court, May 20, 2002), LEX/DB Reference No. 28071876

#### 1) Case Overview

In this case, the plaintiff, a first-time mother A, had been diagnosed with impending premature labor and was prescribed tablets for uterine contraction inhibition (ritodrine hydrochloride). However, A experienced increased lower abdominal pain, leading her to contact her doctor, who worked at a university hospital, seeking guidance. A was admitted to the hospital (at 35 weeks and 5 days of pregnancy) on the doctor's instructions; the obstetrician, in collaboration with a midwife, provided general medical care. Approximately 20 min after admission, the midwife was instructed by a doctor to perform cardiotocography (CTG). Despite attempts to perform CTG, the fetal heartbeat could not be confirmed. Subsequently, the obstetrician confirmed advanced bradycardia using ultrasonography. Baby B was delivered via an emergency cesarean section. Unfortunately, the premature separation of the normally implanted placenta resulted in severe neonatal temporal death and subsequent disability, specifically cerebral palsy, in baby B.

#### 2) Issue of Law

The primary point of contention was whether or not the hospital acted negligently by failing to promptly measure the fetal heart rate using CTG after the patient's arrival at the hospital.

#### 3) Court Judgment on the Issue

The court determined that when Mother A was admitted to the hospital for the first time, she exhibited severe lower abdominal pain, pale complexion, cold extremities, and a rigid abdomen. These symptoms were indicative of the initial signs of premature separation of the normally implanted placenta. Consequently, the doctor had a duty to promptly measure the fetal heart rate. Given that the doctor was conducting the examination in collaboration with the midwife, it was possible for them to concurrently attempt to perform a CTG while conducting the general examination. However, the doctor failed to initiate the measurement of the fetal heart rate, prioritizing vital signs and internal examination instead.

#### Case 2 (Osaka High Court, September 13, 2005), LEX/DB Document No. 28110568

#### 1) Case Overview

In this case, Mother C was admitted to the hospital with a diagnosis of placenta previa. Due to genital bleeding, she underwent a cesarean section at 31 weeks and 4 days of pregnancy. Upon birth, baby D displayed poor general color and weak muscle tone, with an Apgar score of 7 at 1 min. The obstetrician administered oxygen using an artificial manual breathing unit bag and noted a slight improvement in baby D's condition. Subsequently, the infant was placed in an incubator with oxygen support and was prepared for transport to the neonatal intensive care unit (NICU) for further care in the prematurity room. The obstetrician entrusted baby D to the midwife after leaving the operating room and proceeded to the prematurity room via the stairs. Meanwhile, the midwife applied an oxygen mask to baby D's mouth and administered oxygen during transport, which involved using an elevator. Unfortunately, baby D experienced respiratory failure and exhibited severe cyanosis during transport. Despite the midwife's

attempts to stimulate the baby, his condition did not improve, and she was unable to take further action. Upon arrival at the NICU, the obstetrician attended to baby D, but he was left disabled due to cerebral palsy.

#### 2) Issue of Law

The main issue in this case pertains to whether or not there was negligence in respiratory management during the transport of the premature baby to the NICU.

#### 3) Court Judgment on the Issue

The court determined that the obstetrician, who proceeded to the NICU ahead of baby D and entrusted baby D's transport to the NICU to the midwife, acted negligently by failing to respond appropriately to the respiratory failure that occurred during transport.

#### Case 3 (Kyoto District Court, October 13, 2006), LEX/DB Reference No. 28112276

#### 1) Case Overview

First-time mother E had a high blood pressure of 150/100 mmHg at the time of admission to the hospital. Fetal heart rate monitoring ("admission monitoring") showed a normal baseline heart rate of 140-150 bpm, but no acceleration was observed. The baseline variability was generally poor, with a single deceleration episode. The midwife brought the recordings to the obstetrician for instructions, and at the obstetrician's discretion, the CTG was removed. About an hour later, the midwife independently measured the fetal heart rate using CTG for approximately 2 min. She observed a baseline fetal heart rate of 140 bpm, but baseline variability was poor. However, she did not report these findings to the obstetrician. Approximately 2.5 hours later, the midwife used a fetal Doppler to measure the fetal heart rate, which was found to be 104-108 bpm. Realizing a significant decrease in the baseline heart rate, the midwife promptly reattached the CTG and resumed fetal heart rate monitoring. The baseline heart rate had further reduced to 100-110 bpm. The midwife sought assistance from other midwives and an obstetrician. Upon the obstetrician's arrival in the labor room, the fetal heart rate had dropped to 70-80 bpm, and meconium staining of the amniotic fluid was observed, indicating an emergency situation. Subsequently, an emergency cesarean section was performed. As a result of the premature separation of the normally implanted placenta, mother E delivered baby F in a state of severe fetal neonatal distress. Baby F was diagnosed with cerebral palsy and was not expected to recover. Additionally, mother E developed disseminated intravascular coagulation syndrome and underwent upper vaginal ablation, rendering her unable to deliver in the future.

#### 2) Issue

The issue was whether or not there was negligence in breaching the duty to continue monitoring the progress of mother E after the CTG was removed.

#### 3) Judgment by the Court on the Issue

Considering that mother E was diagnosed with gestational hypertension and was at a higher risk of experiencing premature separation of the normally implanted placenta, the obstetrician had a duty to order continuous or intermittent fetal heart rate monitoring upon receiving the admission monitoring report from the midwife. The court determined that the duty of care had

been breached. Furthermore, the court recognized that relying solely on fetal heart rate measurements was insufficient for the midwife to adequately monitor the condition. Fetal heart rate monitoring could detect bradycardia and tachycardia but could not detect transient fluctuations in fetal heart rate or its relationship with uterine contractions.

#### Discussion

This section analyzes the factors contributing to inadequate collaboration between midwives and obstetricians and proposes necessary measures to reduce the risk of medical errors and adverse events. It also discusses the associated legalities and provides evidence that the measures proposed here are useful.

#### Failure to Promptly Measure the Required Parameters

When mother A was admitted to the hospital, she presented with severe lower abdominal pain, which was indicative of the premature separation of the normally implanted placenta. Additionally, her pale face, cold extremities, and stiff abdomen were signs of a potentially serious condition (Brandt et al., 2023). It was crucial for the midwife, who examined the patient alongside the doctor, to recognize the significance of the initial response upon admission and consider appropriate measures accordingly. The court also emphasized the importance of dividing the attention and responsibilities of obstetricians and midwives in providing medical care. The case summary suggests that the midwife could have attempted to prepare for CTG while the doctor examined the patient. This case highlights that relying solely on waiting for a doctor's instructions is insufficient to safeguard the life of a newborn. Eggermont showed that adequate education with solid expertise in fetal heart rate monitoring can maximize the likelihood of a safe delivery (Eggermont, 2015). Therefore, midwives must recognize the potential risks and complications associated with delivery and promptly consider preventive measures and countermeasures. In Case 1, since the primary concern was to assess the health of the fetus, continuous real-time monitoring of the fetus from the moment of admission, such as using a monitoring device, was crucial. To enable such proactive measures, obstetricians and midwives need to discuss how to collaborate effectively on a daily basis. The foundation for this collaboration lies in establishing a good working relationship between the two parties. In Japan, midwives are legally permitted to assist with normal deliveries (Health Nurse Midwife and Nurse Practitioner Act, Article 3). However, in abnormal deliveries, such as that in this case, it is essential for midwives to follow the doctor's instructions while communicating their perspectives and implementing their care practices (Ministry of Health, Labour and Welfare, 2021).

A case similar to those included in the present study is one with the verdict of the Supreme Court on April 28, 2017, wherein a pregnant woman who had developed placental abruption during hospitalization died after an emergency cesarean section was performed when the midwife reported the inability to detect fetal heartbeats to the physician.

#### Inappropriate Respiratory Management During Transport to the NICU

It was important to predict the risk of deterioration during the transportation of baby D, who was delivered by cesarean section at 31 weeks of gestation. Furthermore, it was necessary to discuss with the obstetrician who should transport the newborn and in what manner. Failure to follow such procedures would likely result in an inability to respond appropriately if the newborn's condition deteriorates, thereby increasing the likelihood of litigation, as in this case.
In the trial, the negligence of the obstetrician, who proceeded to the NICU ahead of the midwife, was recognized. However, it is necessary to consider the practical skills of the midwife who only provided oxygen supplementation using a mask. This is because midwives have a professional responsibility for their own decisions and actions (International Confederation of Midwives, 2008). The Japanese Society of Obstetrics and Gynecology developed the Japanese version of the Neonatal Cardio-Pulmonary Resuscitation (NCPR) guidelines and started conducting training workshops for perinatal healthcare providers (The Japanese Society of Obstetrics and Gynecology, 2007). This initiative plays an important role in providing healthcare providers with the necessary knowledge and skills for neonatal resuscitation and preparing them for emergencies immediately after birth. Midwives involved in deliveries should receive regular training based on the "Guidelines for Neonatal Resuscitation" and acquire the latest resuscitation techniques to be able to perform newborn resuscitation at any time (Murakami, 2018). The importance of the systematic repetition of knowledge and skills through training programs is obvious (Cetinkaya et al., 2022). Failing to do so would likely be considered a breach of the duty of care. This is because, in a medical accident, the existence of a breach of duty of care is determined by nursing standards, which assume a certain level of nursing knowledge and skills at that time (Ishii, 2015).

A case similar to the ones included in the present study is the Osaka District Court, January 24, 2023 case, wherein a newborn baby at 4 h of age showed facial cyanosis, pallor, decreased muscle tone, and moaning; the midwife stimulated the baby to encourage breathing, but the pallor did not improve.

## Failure to Identify Fetal Distress in Fetal Monitoring

Dr. D, who instructed that admission monitoring be discontinued, did not provide any specific instructions to the midwife. The midwife only performed hourly fetal heart rate monitoring using Doppler and did not report it to the doctor despite noticing the lack of baseline variability. According to the obstetric clinical practice guidelines, primiparous woman E required continuous monitoring (The Japan Society of Obstetrics and Gynecology, 2020). Furthermore, during inpatient monitoring, her baseline variability decreased, and a single episode of bradycardia with a late deceleration pattern occurred. Based on the classification of fetal heart rate waveforms, the waveform was classified as level 3 (mildly abnormal waveform), indicating the need for continuous surveillance (The Japan Society of Obstetrics and Gynecology, 2020). According to the causal analysis report from the obstetric medical compensation system, abnormalities were observed in 28.1% of the inpatient fetal heart rate tracings, and cases with early deceleration or mild, variable deceleration accounted for 15.6% (The Japan Obstetric Compensation System for Cerebral Palsy, 2015). To improve the quality of obstetric care and prevent recurrence, midwives and other healthcare professionals should undergo training to accurately assess fetal heart rate waveform patterns. Midwives are responsible for independently managing labor and delivery without relying solely on the instructions of obstetricians. As part of their specific duties, midwives must continuously or intermittently monitor the fetal heart rate and accurately interpret readings. In such cases, midwives are expected to exercise their own judgment and take appropriate actions. Eggermont (Eggermont, 2015) reported that failure to identify fetal distress during fetal monitoring is the most common cause of midwifery liability. However, it has been speculated that midwives do not frequently encounter obstetric emergencies or high-risk deliveries, making it impossible for them to acquire the skills necessary to manage such events through clinical experience alone. Therefore, supplementary training is necessary (Høgh et al., 2021). Furthermore, additional safeguards against errors can be implemented in a team setting through monitoring, double-checking, and mutual backup (Vincent, 2010). Thus, it becomes necessary to further explore the effectiveness of collaborative education between midwifery students and obstetrics and gynecology residents (Avery et al., 2022).

A case similar to those included in the present research is the one where a midwife reported the  $SpO_2$  (saturation of percutaneous oxygen), respiratory rate, heart rate, tachypnea, and weak effort of the baby but failed to report facial cyanosis, pallor, and moaning, leading to negligence. The midwife was found to have violated her duties of continuously preparing for CTG and of reporting the fetal condition to the physician (the Gifu District Court verdict on November 21, 2012).

## **Importance of Continuing Education for Midwives**

Learning from past mistakes can prevent medical accidents, and the importance of continuing education for midwives cannot be over-emphasized (Guidera et al., 2012). Midwifery licenses are not renewable in Japan. Therefore, a certification system called Advanced Midwifery was created in 2015 (Japan Institute of Midwifery Evaluation, 2015). Advanced Midwives are objectively evaluated professionals with advanced knowledge, skills, and the ability to independently provide standard midwifery care. They provide in-hospital midwifery care, midwifery outpatient services, and care for older women and high-risk expectant mothers. They are expected to work in teams and collaborate with physicians and nurses during abnormal deliveries.

Owing to advancements in healthcare, the field of midwifery is also constantly evolving. Midwives need to acquire the latest knowledge and skills and provide care based on the latest guidelines and best practices. Therefore, continuing education is an essential means for midwives to promote a safe environment and prevent medical errors. It also helps improve skills in teamwork, delegation, and information sharing within the team.

#### **Study Limitations and Conclusion**

This study is limited to cases reported in legal databases; therefore, it may not capture the complete picture of medical malpractice litigation cases that focus on the collaboration between midwives and obstetricians. However, it provides a deeper understanding of the collaboration between midwives and obstetricians, which is expected to improve patient management, safe childbirth, and maternal and child health. In the United States, there is a pressing need to promote effective collaboration between midwives and obstetricians (American College of Obstetricians and Gynecologists, 2018). It is equally important to establish a similar model in Japan. Further research highlighting the real-life experiences of midwives and obstetricians is necessary to achieve this goal.

In conclusion, based on the analysis of situations requiring an immediate response during hospital examinations, the transportation of premature infants with immature lung function from the operating room to the NICU, or continuous monitoring, midwives and obstetricians should leverage their respective expertise, maintain constant communication, and collaborate to provide optimal care. This study emphasizes the need for improved collaboration, self-improvement, and autonomous decision-making by midwives and obstetricians to enhance the quality of care and prevent adverse events.

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## Exploring the Relationship Between Thai EFL Learner's Communication Competence, Gender, and Extramural English: A Study in Teacher Training University

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#### Abstract

The L2 communication competence is a vital skill for enhancing learners' global communication, academic and professional opportunities, cultural understanding, cognitive development, and social integration. This study investigates on the level of Thai EFL learner's communication competence and what relationship between Thai EFL learner's communication competence, gender, and extramural English. The research method is deemed a survey research design. Participants included 102 college students, learning English as a foreign language (EFL) in department of English education at Lampang Rajabhat University. They were drawn by using simple random sampling technique. Data was collected by using the Self-Perceived Communication Competence Scale (SPCC), Extramural English Use Scale (EEUS), and demographic questions. Descriptive statistics were used to analyze the relationship between communication competence, gender, and extramural English. The result revealed that Thai EFL learner percieved thier English communication competence in low level. Multiple regression analysis indicates that extramural English engagement were significant predictors of the communication competence.

Keywords: Communication Competence, Extramural English, EFL Learners

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#### Introduction

Over the past decade, the emergence of diverse students is assigned to refer streaming the high competencies of 21st century particularly in the area of communication. This shift has posed significant challenges in ensuring effective learning outcomes, especially regarding college students' proficiency in English communication competence (Kang, 2024). Effective communication skills are integral to academic and professional success, suggesting that colleges must address the varied needs of diverse student populations to foster these abilities (Trilling & Fadel, 2009). The challenge is enhanced in English as a Foreign Language (EFL) school, where learners often experience difficulties related to cultural, linguistic, and cognitive factors (Richards & Schmidt, 2010). Therefore, addressing these challenges requires targeted instructional strategies, such as integrating intercultural competence, leveraging technology-enhanced language learning tools, and combined the outside of classroom activites to support diverse students in achieving high levels of English communication competence (Reinders & White, 2016).

English as a Foreign Language (EFL) learners with higher communication competence are better equipped to navigate real-world communicative situations, fostering greater confidence and motivation (McCroskey & McCroskey,1988). Additionally, exposure to Extramural English (EE) activities include online interactions and multimedia engagement offers opportunities to enhancecommunicative abilities in informal settings (Sundqvist, 2009). To propose high benefit for English learner especially in communication competence, effective communication competence could facilitates language learning and promotes intercultural understanding, adaptability, and the ability to integrate into English-speaking environments. As a result, fostering communication competence is asignificant component of EFL education that enabling learners to achieve their learning goal.

Of great significance to educators today is the shift in teaching and learning management which involves transforming traditional classroom instruction into learning platforms. These platforms emphasized online or outside-the-classroom learning. On the other hand, in English as a Second Language (ESL) contexts where learners frequently encounter opportunities to use English in daily life. English as a Foreign Language (EFL) learners in Thailand have limited exposure to English particularly in communicative settings outside the classroom. They also engage with English through activities as extramural English which refers to the use of English outside formal classroom. One argument also highlights gender differences in language competence. Gender differences have been identified as varying factors influencing communication competence emphasizing distinct patterns in how females and males approach communication. This suggests a focus on understanding how communication competence differs across genders.

However, there is little study describing and presenting an understanding of whether EFL learner develop their communication competence through real- life activities or extramural English activities integrated with technology, and how their communication competence can be predicted using extramural English activities. In this regard, it should be investigated to account the level of Thai EFL learner's communication competence and examined the relationship between Thai EFL learner's communication competence, gender, and extramural English.

## Literature Review

## **Communication Competence**

Canale and Swain (1980) and Canale (1983) conceptualized communicative competence as a synthesis of knowledge and skills necessary for effective communication, encompassing four main components: grammatical competence (understanding grammar, vocabulary, and language rules), sociolinguistic competence (using language appropriately in social contexts), discourse competence (organizing communication cohesively and coherently), and strategic competence. Later models, Byram (1997) and McCroskey and McCroskey (1988) expanded on this by incorporating intercultural competence, actional competence, and the function of communication apprehension. These approaches underline that communicative competence is more than linguistic knowledge. It is also about adapting language use to social, cultural, and emotional circumstances, which is essential for meaningful and effective communication especially among EFL students. Furthermore, McCroskey and McCroskey (1988) mentionted the need of both communicative ability and communication anxiety in effective communication. Communication competence encompasses verbal and cognitive skills as well as an individual's willingness to communicate. These include both the confidence in expressing oneself and a proactive desire to interact. McCroskey and McCroskey (1988) also mentioned that establishing supportive the environment can assist students minimize anxiety, increasing their willingness to participate and boosting overall communicative outcomes.

## **Extramural English**

Extramural English (EE) has been extensively discussed in language learning research. Sundqvist (2009) defines EE as English exposure and involvement outside the classroom, encompassing activities like gaming, watching television, reading, or engaging with online communities. This definition emphasizes learner-initiated engagement, highlighting that EE is voluntary and may serve both deliberate and incidental language learning purposes (Sundqvist & Sylvén, 2016). Similarly, Kuppens (2010) identifies EE as a critical aspect of informal language learning through media and digital platforms, underscoring its role in vocabulary acquisition and language competence. Reinders and Benson (2017) expand the concept by connecting EE with out-of-class autonomous language learning, highlighting its potential for fostering language proficiency through self-directed practices. Moreover, Chan (2016) presented extracurricular activities participation can result in even more impact and playing important parts in whole-person education and life-wide learning. To summary, EE represents a dynamic and flexible mode of language learning that integrates seamlessly into learners' everyday lives, offering both structured and incidental opportunities for English acquisition.

## **Gender Difference**

Gender differences have been stated in vary role of the factor influencing communication competence with highlighting distinct patterns in how females and males approach communication. Females often demonstrate stronger interpersonal communication skills than male include empathy, active listening, and the use of supportive language, which are critical components of communication competence (O'Neill et al., 2016; Burleson, 2003). However, males often exhibit greater confidence in public speaking and leadership communication, potentially influencing their communicative behaviors in professional and academic settings (Eagly & Karau, 2002). This recent findings indicating that females excel in collaborative

communication due to their emphasis on empathy and mutual understanding, whereas males demonstrate strengths in goal-oriented and directive communication, particularly in professional contexts (Burleson, 2003). These insights emphasize the nuanced interplay of gender in shaping communication competence, highlighting the importance of fostering balanced approaches to improve inclusivity and effectiveness in diverse communicative settings.

Researchers analyzed and synthesized the concept and theories according to the variables that include in this study. The research concern the gender difference and extramural English influence learners' communication competence. The conceptual framework is shown in Figure 1.



Figure 1: The Relationship of Learners' Communication Competence, Extramural English, and Gender Difference Model

## Methodology

The purpose of this study is to investigates the level of Thai EFL learner's communication competence and to examine the relationship between Thai EFL learner's communication competence, gender, and extramural English. The research method is deemed as survey research that collected data using the online survey.

## Participants

The samples were drawn by using simple random sampling technique from college students who learning English as a foreign language (EFL) at Lampang Rajabhat University, Thailand- the teacher training University. There were 102 college students in English major included 80 females (76.92%) and 24 males (23.08%).

## Measurement

The Self-Perceived Communication Competence Scale (SPCC) developed by McCroskey and McCroskey (1988) was utilized for capturing the leaners' communication competence. The SPCC was the scale that scoreed ranking from 0 to 100 with seven subscales and 12 items. The Extramural English Use Scale (EEUS) was utilized for measuring how often learner do activity that the scale was modified based on the original developed by Coskun and Mutlu (2017) include 6 items. The Cronbach's alpha reliability coefficient was calculated to be 0.82 ( $\alpha = 0.82$ ) that indicated high reliability of the scale. Furturemore, 4 items of demographic questions included in the scale.

## Procedure

The procedure of research took place in three six steps (see also Figure 2). In the first step, identify the particular scope of the topic and develop the topic covering the English learning, then inquire about the information with the step of reviewing literature. The following step is to develop the research design, including the sampling design, measurement design, and analysis design to plan conducting of effective academic research. Also, the online survey utilize for collecting data. After receiving the proper response, data were analyzed by using a statistics program. The research report was conducted from the summary result of this study.



Figure 2: Flowchart of the Research Process

## Data Analysis

Descriptive statistics were used to report the result and determine the level of communication competence. Multiple regression analysis was used to analyze the relationship between communication competence, gender, and extramural English.

To describe learner's communication competence, the competence was interpreted into 3 categories with eight context or receiver group as shown in Table 1 (McCroskey & McCroskey, 1988). In summary, higher SPCC scores indicate higher self-perceived communication competence with basic communication contexts (public, meeting, group, dyad) and receivers (strangers, acquaintance, friend). On the other hand, lower SPCC scores indicate lower self-perceived communication competence with basic communication contexts (public, meeting, group, dyad) and receivers (strangers, acquaintance, friend).

Communication Contexts and Receiver Types					
Context/	Score	SPCC	Context/	Score	SPCC
Receiver		level	Receiver		level
Public	greater than 86	high	Stranger	greater than 79	high
	51 - 86	moderate		31 - 79	moderate
	lower than 51	low		lower than 31	low
Meeting	greater than 85	high	Acquaintance	greater than 92	high
	51 - 85	moderate		62 - 92	moderate
	lower than 51	low		lower than 62	low
Group	greater than 90	high	Friend	greater than 99	high
	61 – 90	moderate		76 – 99	moderate
	lower than 61	low		lower than 76	low
Dyad	greater than 90	high	Total	greater than 87	high
	61 – 90	moderate		59 - 87	moderate
	lower than 61	low		lower than 59	low

Table	1: Score and Level of Communication Competence	Across
	Communication Contexts and Receiver Types	

### Results

### The Level of Communication Competence

The result of the college students as EFL learners level of communication competence was varing, as shown in Table 2. Overall, the majority of EFL learners were categorized as having low communication competence, accounting for 57.69% which the mean score was 53.48 (as shown in Figure 3).

When considering communication competence within specific basic communication contexts, the highest percentages presented at the low competence levels as follows: 49.04% in the public context, 58.65% in the meeting context, 55.77% in the group context, and 69.23% in the dyadic context. Furthermore, when examining the communication competence based on the receiver types, the data indicated that 52.88% of learners demonstrated a moderate competence level when communicating with strangers, while 61.54% and 66.35% presented the low competence levels when communicating with acquaintances and friends, respectively.

Table 2: The Level of Communication Competence Among EFL Learners						
Context/	SPCC Level					
Receiver	High Moderate		Low	score		
	(percentage of	(percentage of	(percentage of			
	EFL learners)	EFL learners)	EFL learners)			
Public	6.73	44.23	49.04	53.15		
Meeting	7.69	33.65	58.65	47.39		
Group	5.77	38.46	55.77	57.43		
Dyad	3.85	26.92	69.23	55.53		
Stranger	7.69	52.88	39.42	42.26		
Acquaintance	2.88	35.58	61.54	53.50		
Friend	1.92	31.73	66.35	64.36		
Communication Competence	4.81	37.50	57.69	53.48		



Figure 3: The Porportion of the Level of Communication Competence Among EFL Learners

# The Relationship Between Thai EFL Learner's Communication Competence, Gender, and Extramural English.

The relationship between Thai EFL learner's communication competence, gender, and extramural English was tested that the model was significant fit of the data, F(1,101) = 10.448, p < .001 (as shown in Table 3).

Evaluation Capability Between Posttest and Pretest Score					
	В	SE	β	t	p-value
Extramural English	15.061	3.358	.407	4.485	.001
Gender	2.679	4.347	.056	.616	.539
Constant	14.097	9.194		1.533	.000

Table 3: The Result of t-test Analysis of Students' Educational Measurement andEvaluation Capability Between Posttest and Pretest Score

To realize any relationship, the predicted equation was addressed below.

 $\widehat{Y} = 14.097 + 15.061*(Extramural English) + 2.679$  (Gender female)

#### **Conclusions and Discussion**

College students as EFL learners reported that their communication competence as moderate to low across most contexts, highlighting potential challenges in achieving higher levels of confidence in interpersonal communication. According to Salikhova (2023) and Yüce (2023) found that EFL learners in higher education self-perceived communication competence levels were moderate. The result variations in EFL learnerss self-perceived communicative competence (SPCC) across a basic communication contexts that reported the highest score in communicate in the group contexts. In cohesive groups with positive norms, learners often exhibit high SPCC due to increased confidence and reduced anxiety. In contrast, less cohesive groups, learners may experience lower SPCC, leading to reluctance in participation (Qian & Yuan, 2022). For the communication competence across the receiver types, the highest score in dyad type was reported. According to Burroughs et al. (2003) stated that dyadic settings foster higher SPCC due to personalized interaction. Furtheremore, the result revealed that the relationship between Thai EFL learner's communication competence, gender, and extramural English was tested that the model was significant fit of the data.

According to, the finding that significant relationship among students' learning climate and self-efficacy and self-perceived communication competence in a positive way was found (Yüce, 2023). Moreover, Griffiths et al. (2021) and Dickinson et al. (2020) stated that the college students' participation in extracurricular activities include academic and social tasks influenced the anxiety and students' confidence to be high that may support the communicate ability in both female and male. Then, these finding shown the supporting for study result of the extramural English related to Thai EFL learner's communication competence.

For implication, the result of this study could effort that the extramural English play the significant role to increase the Thai EFLs' college students, communication competence. Therefore, the lecturer will decide to include activities that enhance learning through extramural English. In future research, researchers should consider other factors or variables that could enhance college students' communication competence, such as the number of study hours per week.

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## Exploring the Use of Generative Artificial Intelligence to Create Digital Vocational Training Courses for Students in Kenya: A Conceptual Approach

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#### Abstract

This concept-based paper seeks to identify new methods for content development of Vocational Education and Training (VET) courses in the Global South. Challenges in Sub-Saharan Africa countries include a lack of VET institutions, qualified teachers, and learning resources. In addition, there is a lack of electricity and limited access to internet connections. However, artificial intelligence (AI) can bridge this educational gap. AI is evolving rapidly day by day, including in the field of education. The use of generative AI images and videos, ChatGPT and open educational resources (OER) to create digital vocational training courses in Kenya is explored. Twenty vocational courses were developed to improve education quality, raising awareness of human rights, health, water, wildlife conservation etc., and especially of providing people in rural areas with the necessary knowledge and skills to generate income. The courses are easy to scale up thanks to the ease of changing text, content, avatars, language, subtitles, etc., to be context-relevant. This paper recommends the use of generative AI and OERs as an approach to reform content development which is a cost-effective way of improving students' vocational skills in Global South. Additionally, this concept paper explores two different systems for students to access the digital vocational training content: mobile technology with the internet and a solar-powered tablet with offline content. The purpose of considering different devices is to offer learning opportunities to people in remote areas with a lack of network connectivity, limited internet access, or a lack of electricity.

Keywords: ChatGPT, Generative AI Video, Vocational Skills, Digital Course, Global South

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#### Introduction

The pandemic had a significant negative impact on students across the world, as schools and universities were shut down due to the Covid-19 outbreak. Pupils and students were sent home, and in developed countries it was still possible to continue with learning online. However, in Sub-Saharan Africa the lack of resources was apparent, and the lockdown widely affected children's and youths' educational future (Hansson, 2021). This resulted in a situation that was a step further away from sustainable goal (SDG) no. 4: "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (United Nations, 2015). The consequences are especially high in Sub-Saharan countries, with their weak educational infrastructure: a lack of formal schools, a lack of qualified teachers, a lack of educational materials, etc. But in a post-pandemic era, can we find new ways to provide education in Africa?

Artificial intelligence (AI) services are developing rapidly, with new applications day by day. AI has huge potential to have an impact in many different areas, including in education to strengthen human capacity. Obviously, there are challenges such as policymaking, legislation, guidelines, copyright, data protection, privacy, ethics, and much more. On the other hand, there are also many opportunities with AI resources. This concept-based paper focus on opportunities with generative AI educational content in the Sub-Saharan African context, and UNESCO (2021) states that AI can provide "leapfrogging" for African countries to improve the capacity of updated education, skills, and training, and thus progress toward SDG 4.

This concept-based paper focuses on the use of AI tools to create vocational learning opportunities in Kenya. More specifically, the research question is to explore how generative AI resources as ChatGPT, AI images and videos can be used to develop content for digital vocational training courses to impact learning for students in Kenya.

#### Background

Definitions of artificial intelligence (AI) vary, and there is no one single definition of AI. Baker et al. (2021, p. 10) define AI as: "Computers which perform cognitive tasks, usually associated with human minds, particularly learning and problem-solving." This is a broad definition that describes a range of technologies and methods, which is wise, not only because the future of AI is uncertain, but also because there are many AI tools on the market that are evolving day by day.

AI can contribute to education at least in two ways: 1) with assistance and modifications of methods, simulations, and scaffolding of feedback and assessment, and 2) with content production. Baker et al. (2019) describe the innovation of AI as providing a) learner-facing tools; adaptive learning platforms with personalized content and automated feedback, which facilitate collaborative learning, b) teacher-facing tools such as automate marking and plagiarism detection, which facilitate teaching methods and administration, and c) system-facing tools to analyzing data regarding schools' performance.

Thus, AI can provide a shift toward a learner-centered approach which is flexible, providing a variety of choices to make learning useful, exciting, and motivating at one's own pace (Hansson, 2021). This is an important step in order to develop quality in online education. In addition, it is important for future education in Sub-Saharan African countries. Digital

education can provide learning opportunities for those who do not attend school or who lack access to formal schools, those who cannot afford school fees, refugees, marginalized people, disabled people, and those living in isolated communities. Mobile technology is widespread in Sub-Saharan Africa, and there is a growing optimism that AI will be the next wave of technologies to impact people's lives positively (Ade-Ibijola & Okonkwo, 2023). Internet penetration in Sub-Saharan Africa has increased significantly during the last decade (Okolo, et al., 2023), from 10 % to 28 %, but a lack of electricity and poor fiber, mobile mast, and base station infrastructure have prevented more people from gaining internet access. According to the World Bank (2023), 81% of the urban Sub-Sahara African Union (2018) states in its strategic plan that educational technology can be used to provide unreached populations with access to learning. Nevertheless, online learning is still out of reach for large populations on the African continent due to a lack of infrastructure, including electricity (UNESCO, 2019a; UNESCO, 2019b).

AI is still in the early stages of development, and faces several challenges in and for the Global South. These include technical, economic, pedagogical, and social challenges, which must be considered when exploring the use of content development with generative AI for vocational training programs. The technical challenges concern access to an appropriate mobile device, a lack of internet access, network failures, and a lack of power (Hansson & Jobe, 2014). Economic challenges related to the cost of digital devices and the cost of internet access. As Ade-Ibijola and Okonkwo (2023, p. 109) point out: "A good percentage of Africa's population are unconnected and not having access to the internet. Adoption of AI requires adequate availability of wireless network connectivity. In addition, African countries have the world's most expensive broadband." One pedagogical challenge is using advanced digital tools and learning platforms when student and teachers have limited experience of online teaching and limited digital competence. Another pedagogical challenge is moving toward a learner-centered approach, with the purpose of making learning motivating, useful, interesting, and personalized, with active participation in learning, whereas students in Sub-Saharan Africa are more used to a teacher-centered approach with its focus on listening, memorizing, and repeating. Finally, social challenges include a lack of familiarity with and ability to use digital technology (Hansson, 2021). Undoubtedly, digital skills need to be improved, particularly in Sub-Saharan Africa. In addition, UNESCO (2021) says that the use of AI has a gender bias, which must be considered. However, generative AI produced content could transform opportunities for students who don't have access to formal schooling and/or quality education by offering them up to date information and knowledge.

## **Theoretical Framework**

To explore the potential of generative AI for vocational training programs in Kenya, and how course content and its design can be created and analyzed, Shulman's (1986; 1987) framework of knowledge bases for teaching can be used. According to Shulman, knowledge can be divided into several aspects: 1) content knowledge, 2) general pedagogical knowledge – broad principles for organization and strategies of classroom management, 3) curriculum knowledge – teachers' tools, such as materials and programs, 4) pedagogical content knowledge – teachers' professional understanding of the content and teaching methods, 5) knowledge of the learners and their characteristics, 6) educational context knowledge – experience from group work or classrooms, and the character of communities and cultures, and 7) knowledge of educational ends – the purpose and values of teaching, and their historical and philosophical roots (Shulman, 1987).

All of Shulman's categories are relevant, but pedagogical content knowledge is of particular relevance for this paper. As Schulman (1987, p. 8) states: "It represents the blending of content and pedagogy into an understanding on how particular problems, topics, or issues are organized, represented and adopted to the diverse interest and abilities of learners, and presented for instruction."

## Method and Approach

This concept-based paper explore the provision of AI powered educational content to less privileged people in Kenva, particularly in rural areas which can be affected by drought, acute poverty, terrorist attacks, cattle rustling, or isolation. Hence, as Shulman (1987) states, educational context knowledge requires an understanding of the community, the culture, and the learners. Achieving an understanding of another culture requires good communication, cooperation, collaboration, and trust (Lennie & Tacchi, 2013; McTaggart, 1997; Whyte, 1991). These criteria are essential for improving and encouraging continuous learning, creating new ideas, and developing thinking and responsiveness to different attitudes and values (Hansson, 2015). This approach is social research, where the researcher intervenes, creates impact, and can contribute to significant differences in practice. However, understanding the local culture, as well as the context and relationships between participants and the context, is highly important in terms of the impact of social change (Lennie & Tacchi, 2013). In order to develop context-relevant vocational training course content, collaboration and trust with tutors and learners are important, as reflected by my more than six years of experience during the past two decades in Kenya, involving educational research projects and a well-established network.

The aim was to produce AI content and create educational design for vocational training courses in Kenya. To do so, we relied on the following sources:

- a) Six Kenyan vocational training tutors from a VET institution in Nairobi. These tutors sent curriculums, course guides, lesson plans, photos, and student instructions via Google documents and videos from their own courses. Additionally, they provided information about vocational training and students' educational backgrounds and life conditions. We also had frequent online conversations to discuss content and course concepts, as well as Shulman's (1987) knowledge aspects, primarily educational context knowledge and knowledge of educational ends.
- b) Our communication with the Kenyan vocational training tutors (a) and their experiences, based also on survey responses from 15 of 45 students in a pilot project, revealed that students are comfortable with video media. The pilot study was conducted by the Kenyan VET institution (a) prior to the production of generative AI videos, thus the video content was produced by the Kenyan tutors. Students in age of 19-33 years could only choose courses in hair dressing, pastry, computer, and entrepreneurship by that time. Findings from a questionnaire revealed they study 2-3 hours per day with use of the tablet. 71 % considered the video content to be appropriate. 29 % stated that they want teacher support because it is difficult to learn practical skills only by themselves. 43 % expressed they want to have a diversity of vocational training courses. In addition, the tutors said that English is the language of instruction, but ideally with Kiswahili subtitles. Other local African languages are not preferred by the students, according to the pilot survey.
- c) The author, who works as a pedagogical content knowledge university educator, and twelve Swedish student teachers in the last year of their teacher training program, with experiences from a field trip to Kenya, produced content and educational design

for the courses based on above input from the Kenyan tutors, together with use of ChatGPT-3.5, generative AI images and videos, and open educational resources (OERs). Thus, the generative AI produced content was checked with the Kenyan tutors teaching material.

d) The created courses were checked by the Kenyan tutors (a), who suggested changes and amendments which were incorporated. However, the implementation of these courses in practice is still pending.

## Findings

The findings are presented based on showing the process of content and design development, including the challenge of access to appropriate digital devices.

## **Digital Devices**

In rural Kenya, there is growing demand for vocational training programs. As mentioned in the background, there is a lack of vocational training schools, especially in rural areas, and a lack of variety of courses due to of a lack of educational resources and few qualified tutors. In addition, there is limited internet access and a lack of electricity. We therefore considered two different systems for the students to choose between, according to their own life conditions. One system enabled students to access the content online via a smartphone, tablet, or computer. Internet data can be offered to the student at a reduced cost (so-called education bundles from the internet provider). The second system is also digital, but the same content is offline. This system uses a tablet powered by a solar panel, and a remote control. The system also includes three bulbs, which are useful in huts at night (see Figure 1). The content can be uploaded with a USB flash drive. The tablet has 32 GB of data storage, so content has to be replaced manually every three months. The tablet can only be used with the remote control – it is only possible to click and select content, and the student is not able to type.



Figure 1: Solar-Powered Tablet, Remote Control, and Bulbs

## Course Content and Development of Design

The literacy rate is high in Kenya, at 83%, compared to a Sub-Saharan Africa average of 67% (World Bank, 2023). However, our assumption is that the literacy rate and English language skills will be lower in remote areas, thus our focus is less on text and more on photos, videos, and animations (cartoon characters). Besides the use of suitable devices and their

functionality to scaffold vocational skills, it is important to create a conducive environment that encourages personalized learning, knowledge, skills, and innovation. Given that, and with the two systems in mind, we decided to explore the use of generative AI to develop content and educational design for vocational training courses. Generative AI such as OpenAI ChatGPT (Chat Generative Pre-Trained Transformer) was launched at the end of 2022, and the free version has already had a huge impact on teaching, learning, knowledge production, plagiarism, etc. According to the developer (OpenAI, 2023), the chatbot is capable of generating human-like text based on context and past conversations.

Our communication with the Kenyan vocational tutors revealed subject-specific concepts and context-relevant text material that was entered into the prompt for OpenAI's ChatGPT-3.5. As a first step, we asked the system to create course guides in relation to the national curriculum and its objectives. The second step was to create lessons plans and define terms based on the tutors' lesson plans and the course guide. The third step was to ask the system to give advice on quizzes, exercises, and examinations. The fourth step involved suggesting practical exercises, which is obviously important in vocational training courses. The fifth step was to include challenges and common mistakes that students make during training for a particular course. Lastly, manuscripts were produced for PowerPoints slides and generative AI videos. The text material was therefore created, which is fundamental in order to create generative AI images and videos. There are a wide range of options for producing images, so we selected free versions which use AI to convert text to images. AI video creation is not free, costing about USD 30 per month for a subscription with a limited number of videos. We selected a service that offered opportunities to use different languages including Kiswahili (from 120+ language options), avatars speaking Kenyan English, a wide range of selective avatars (with digital speech but no body language), subtitles, animation, and the option of including YouTube videos in the AI video, with a media library to select images/videos from. Figure 2 shows a screen print of an AI video in the course of pastry cook. Once the text has been inserted and the template, avatar, language, subtitles, and background text have been selected, the system takes about ten minutes to generate a five-minute video. The video can be low or high resolution (4K), at about 100 Mb for a five-minute video.



Figure 2: Screen Print of Pastry Course

We also searched for and inserted open educational resources (OERs) in the form of images, learning material, e-books, YouTube videos, etc., into the courses. Within two months, 20 vocational courses has been created, including courses in hairdressing, pastry, computing, plumbing, tailoring, woodwork, poultry, agriculture and entrepreneurship. Information was also produced on health, oral health, water, human rights, biogas use, and wildlife conservation. See Figure 3.



Figure 3: Screen Print on Information of Wildlife Conservation A Video Is Integrated in the Background of the Generative AI Video

These courses were sent to the Kenyan vocational tutors, who mainly suggested additional content for the lesson plans, but also requested minor changes to the learning methods. These changes were implemented, including updating the AI videos. The generative AI videos are easy to update with new content, or to translate into another language within minutes, and it is thus possible to revise the content later and adapt it using local expertise according to local needs.

#### Discussion

In VET, online resources are frequently tested to impact learning. However, digital systems that are totally offline are not used, as explored in this paper. Shulman (1987) describes this as knowledge of educational ends and educational context knowledge. Hence, this involves awareness of the purpose of the education, values of teaching, and the local context, including knowledge of the learners and their life conditions. It also involves building digital literacy and vocational skills offline so that knowledge acquisition can be achieved using generative AI and applied to courses in rural areas where electricity and internet access are challenging. According to UNESCO (2019, p. 28): "Recent studies have mapped the obstacles for introducing AI in education in developing countries. The main ones include 1. ICT hardware availability, 2. Electrical availability, 3. Internet reliability, 4. Data costs, 5. Students' basic ICT skills, 6. Language and 7. Lack of culturally appropriate content." Thus, there are challenges relating to knowledge, skills, finance, and infrastructure. AU (2018) encourages more affordable access to educational institutions, encourages the use of technology in education, and promotes information skills. Clearly, digital literacy must be strengthened in Sub-Saharan African countries. However, with the use of simple learning systems and video-based skill development courses, including basic computer skills, the next level of digital literacy is approachable for students. In any event, the training must be relevant to the student's needs and adjusted to the local context. According to Shulman (1987), content knowledge is the subject's width and depth, and the pedagogical content knowledge aspect of using appropriate teaching methods relates to learners' pre-understanding, educational level, and educational content, including appropriate language of instruction. This presents challenges for our AI content development and the creation of educational digital design. According to the Kenyan tutors, a diverse group of students can be expected. Learners will usually be aged 18 to 25, but may also be younger or older. Most of them will have finished secondary school, but some will only have attended primary school and then dropped out of school. It is important to reach such learners

with vocational training programs, so they also needed to be considered. In addition, students' language skills will vary. Most of them will have sufficient English skills, but we will likely see students who barely understand English, only Kiswahili.

Our solution to address this complexity was to use generative AI created lesson plans and videos at basic and general level, and at advanced and deeper level, and videos with English-speaking and Kiswahili-speaking avatars. The system enabled us to achieve this in a few minutes. Course content adjustments were made according to the locations where the Kenyan tutors wanted to implement the courses. Thus, for example, a course in tailoring and handicraft for a Massai community in southern Kenya will be different to the same course for communities in Turkana (northern Kenya). It was quick and easy to make these changes using generative AI resources.

## Conclusion

However, this paper explores content development and design of vocational courses in Kenya using generative AI. From the findings, conclusions are that digital vocational training programs and additional information are easy to scale up, within both Kenya and other Sub-Saharan African countries, thanks to the ease of changing text, content, avatars, languages, subtitles, etc., in order for the generative AI resources to be context-relevant. Thus, AI offers considerable opportunities for the Global South. Additionally, Baker et al. (2021, p. 5) say: "while there is considerable uncertainty surrounding the future of AI in education, we don't have to sit and wait. There is much that we can do today to shape the future positively."

This concept-based paper explores good practice and proposes that AI-driven digital vocational training programs should be adopted in Kenya. In a limited time, 20 vocational training courses were created in collaboration with Kenyan tutors using generative ChatGPT, and AI images and videos, and are now ready to be implemented. This study recommends the use of generative AI and OERs as an approach to reform VET content development in order to be locally and globally relevant for future workers. This is a cost-effective way of improving students' vocational skills. Since vocational skills are required worldwide, and since content development with generative AI can be carried out in any language, the conclusion is conceptual, generic, and applicable elsewhere. Furthermore, the study examines two different digital systems for the student to access the same digital content: online and offline. The purpose of recommending the use of different digital systems is to offer opportunities to people in remote areas where the internet and electricity are uncommon or unreliable. This is a favorable way forward for SDG 4 in the Global South, and thus represents a way forward for those who are at the last mile.

## Limitations

Although the exploration shows promising results, there are also limitations to the study. One limitation is the absence of prior research with a similar focus on digital VETs in the Global South. A more extensive literature review on similar research about vocational training programs would have provided a solid foundation for understanding challenges. Another limitation is that this is an explorative concept study. Even if courses are developed, they still must be implemented and empirically validated by Kenyan students.

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## **Conflicts of Interest**

The author has no competing interests to declare that are relevant to the content of this article. The author has no financial interests to disclose.

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## "Mosaic Landscape" of Teaching and Learning Professional Vocabulary at English for Specific Purposes Studies at University

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#### Abstract

A university is a higher education institution where students acquire their professional and communication competences and develop 21st century skills. These skills are acquired through an English for Specific Purposes (ESP) study course designed for landscape architects. The University's curriculum includes learner-centred ESP study with the overarching goal of teaching and learning professional vocabulary in all undergraduate programmes. The ESP curriculum is based on self-regulated learning (SRL) in which students take an active role in their own learning process. Students construct their own personal understanding, which depends on each student's experiences and worldviews. They also understand their needs, reflect on their learning and monitor their progress. Through various teaching and learning activities, they continually learn how to use and extend subject-specific language. The aim of the study is to analyse students' opinions on teaching and learning activities and methods of expanding professional vocabulary in self-regulated undergraduate studies in the ESP programme "Landscape Architecture and Planning" at the Latvia University of Life Sciences and Technologies (LBTU). The results of the study were obtained in a survey in which 25 undergraduate students of landscape architecture at the university participated. The students evaluated 5 teaching/learning activities, 4 activity implementation methods, SRL and - the effectiveness of the expansion of professional vocabulary. The data obtained shows that students highly value giving realistic subject-specific profession related presentations where they can find relevant vocabulary and create new content. The task strongly encourages the use of professional vocabulary. SRL supports the expansion of professional vocabulary.

Keywords: Self-Regulated Learning (SRL), English for Specific Purposes (ESP), Professional Vocabulary, Landscape Architects

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#### Introduction

The author describes the ESP study course at the university on the basis of the definition of landscape architecture, which defines a particular landscape in nature - landscape mosaic. A landscape mosaic is a heterogeneous area consisting of different communities or a collection of different ecosystems (Foreman, 1995; Meshram, 2020). This means that a landscape mosaic contains many aspects from different ecosystems that can coexist and interact with each other to form a unit.

The author of the article describes English for Specific Purposes (ESP) for landscape architects and planners at the Latvia University of Life Sciences and Technologies (LBTU) as a course of study in which the teaching and learning (teaching/learning) of professional vocabulary occurs by combining different elements to support the effective acquisition professional vocabulary. In addition, external factors should also be considered - society and the job market expect graduates to be critical thinkers, creative, have excellent communication and collaboration skills, be able to solve problems and be able to fit into the 21st century professional environment.

ESP for Landscape Architects is a compulsory part of the "Landscape Architecture and Planning" study programme. It is a learner-centred course developed in collaboration with practicing professionals to meet the professional needs of students. The acquisition of professional vocabulary is influenced by several factors – students' prior learning experience, motivation, behaviour, cognition, and metacognition. ESP is designed to facilitate understanding of professional content and promote engagement in academic and professional discourse.

The author analyses the professional vocabulary for landscape architects and focuses on the word categories. It is subject specific vocabulary which includes high- and low- frequency words, technical words and academic vocabulary. The teaching/learning of professional vocabulary is described as a process-oriented approach in which students expand vocabulary, create their own lists of professional vocabulary, read and analyse scientific texts, and create their own content. It is based on SRL.

"Purposefully managed self-directed university studies are highly important because they put a stress on each student's higher responsibility, initiative, motivation, independence, collaboration and self-assessment ... to cope with a lot of requirements, tasks and aims...." (Briede, 2016)

Students main task is to design their own learning journey to extend professional vocabulary. Obtaining of professional and communicative competence through the implementation of effective teaching/learning activities is the highest learning outcome.

This article focuses on the analysis of teaching/learning activities of professional vocabulary for landscape architects and how self-directed learning can support the extension and use of subject-specific language in ESP.

The aim of the study is to analyse the students' opinion regarding teaching/learning activities and activity implementation methods of expanding professional vocabulary in self-regulated undergraduate studies in the ESP study programme "Landscape Architecture and Planning" at the Latvia University of Life Sciences and Technologies.

#### **Content of Professional Vocabulary for Landscape Architects**

The general task of ESP at the Latvia University of Life Sciences and Technologies is to teach students to read scientific texts on topics relevant to their profession and to engage in academic oral and written discourse. In ESP classes, students must expand their knowledge of subject-specific vocabulary and relate the acquired vocabulary to their own content. It is known from theory that different words have different values for students. S. Webb and P. Nation (2024) analyse words classified according to their frequency of use in different types of discourse. The researchers distinguished the following categories of words: high- and lowfrequency words, technical words and academic vocabulary. High-frequency and lowfrequency words are learned during the language learning process. Students produce language with both types of words that are widely used in everyday life. Technical words can be lowfrequency words in everyday language that occur frequently within a particular subject area but less frequently outside the subject area. It can be observed that technical words stand for specialised knowledge that is important for learning a certain topic. Technical words form a specialised vocabulary that occurs frequently in the literature and in various resources on a particular subject area. In addition, technical words convey meanings that are central to understanding topics in landscape architecture and urban planning. Academic words are needed to understand subject-related academic texts (Webb & Nation, 2024). It is mentioned that,

"... Academic words to be used to support the use of technical vocabulary.... Academic words pose challenges to learners because they are not well known, are typically not taught in content-based courses, and are less noticeable than technical vocabulary." (Coxhead 2000; Webb & Nation, 2024, p. 16)

The current situation shows that students have to learn technical vocabulary and academic words as part of their studies in landscape architecture and planning. Learning professional and academic words has a positive effect on the comprehension of academic discourse (lectures and academic texts), because it has been shown that knowledge of vocabulary has a great influence on whether texts are understood or not. Academic texts will be difficult to understand if many words are unfamiliar (Laufen & Sim, 1985; Webb & Nation, 2024). The ESP curriculum foresees teaching/learning of subject-specific vocabulary or professional vocabulary for landscape architects is a subject-specific vocabulary that includes technical and academic words, various subject-specific word lists for reading and discussing scientific texts and participating in professional and academic discourses on landscape architecture and planning. New technical and academic words should occur frequently when students use and produce English language on profession-related topics.

Professional vocabulary for landscape architects is closely linked to the tasks, responsibilities daily routine and professional environment of landscape architects and planners. The professional vocabulary of landscape architects should cover all aspects in which professionals operate. Their main task is to create and develop new designs for various private and public outdoor spaces. They also take part in landscape renewal projects where their main task is to create sustainable designs. Landscape architects have to evaluate sites from various aspects, taking into account the geography, the history of the site, the infrastructure and the general development plans of the wider area. They must work in accordance with local, national and international legislation and obtain the necessary permits from various state and local authorities. They work at local government agencies to plan new urban designs, prepare written reports on local government areas in the urban environment.

They participate as experts in various international projects for which they need foreign language skills. In addition, presentation skills and other 21st century skills are essential. To summarise landscape architects need to acquire a wide range of knowledge covering many profession-related topics where professional vocabulary is crucial. The teaching/learning of professional vocabulary is a long-term, process-oriented approach consisting of various teaching/learning activities and methods. The ESP course should provide a stable platform for the acquisition of professional vocabulary.

## Students' Self-Regulated Learning

The ESP studies at LBTU are based on self-regulated learning (SRL), where students control and regulate their own learning. SRL involves students actively participating in their learning process by setting goals, planning, and choosing strategies to improve their performance. They learn at their own pace, monitor their progress, and adapt based on feedback.

SRL learners identify their language-related, learning-related, and emotional needs. Language-related needs include expanding vocabulary, improving reading and writing, and developing presentation skills.

Oxford University experts recommend starting courses by understanding successful learning, linking SRL with motivation. Motivation enhances self-regulation, leading to better academic performance (Reinders et al., 2023). SRL is also known as self-directed learning (SDL), focusing on adult learning. According to Latvian researcher B. Briede (2016), SDL involves maintaining cognition, emotions, and motivation to achieve personal goals, with time management and planning as key components.

SRL has four key phases:

- Defining tasks
- Setting goals and planning
- Enacting learning strategies
- Monitoring and reflecting

The acquisition of professional vocabulary is systematic and continuous, based on individual abilities. SRL emphasizes the student's inner activity, including perception, awareness, application, decision-making, action, and feedback. The lecturer's role is to guide students in self-regulated learning, challenging them with tasks and providing choices. The goal is for students to self-regulate all aspects of learning and design their unique learning paths. SRL involves cognition and metacognition, crucial for planning and controlling learning processes.

Metacognition includes three types of knowledge: knowing about oneself as a learner, knowing about the task, and knowing about learning strategies (Williams et al., 2019). It helps students understand their cognitive processes, choose effective learning activities, and expand their professional vocabulary in landscape architecture and planning. Metacognition is crucial in ESP studies as it encourages students to think and reflect about how they organize their learning and use professional vocabulary.

Researchers Williams, Mercer, and Ryan (2019) explored how language is learned and processed. SRL's constructive approach emphasizes students' active roles and cognitive development. Students construct personal understandings from their experiences, fitting new

information into existing knowledge or modifying what they know. This process helps them use information in new or complex situations.

SRL involves students actively creating new understandings, developing their perception of the world, and participating in various ESP activities. These aspects of SRL influence the acquisition and expansion of professional vocabulary. Students interpret information individually, which helps them understand how language works.

In ESP classes, students' experiences, beliefs, thoughts, feelings, and learning methods affect how they perceive and construct knowledge. They take responsibility for learning professional vocabulary, creating word lists based on their needs and interests. Teaching/learning activities should support their learning targets. Students' reflections on the learning process are crucial, showing how new vocabulary works within the language framework.

Learning ESP and acquiring professional vocabulary should be personally important, especially for students in the "Landscape Architecture and Planning" program. SRL helps students expand their professional vocabulary and relate it to their own contexts. It aids in dealing with scientific and professional texts, participating in academic and professional discourse, and expressing opinions about professional opportunities.

## **English for Specific Purposes at University**

P. Kletzenbauer and A. Moser argue that ESP focuses on the language areas necessary to meet the professional and/or academic demands of a particular field and that learner-centeredness is paramount. An understanding of specific language needs, excellent pedagogical skills and knowledge of students' specific professional contexts are elements that form the foundation of ESP. Teachers often work with learners and experts in a particular field to consider the needs and goals of the learners and to ensure that the materials provided by the teacher are relevant to the learners and reflect the current reality in landscape architecture. Researchers Dudley-Evans and St. John (1998) have characterised language professionals' approach to teaching/learning and ESP as follows: Practitioners often plan the course and provide the materials for it, as it is rarely possible to find and use a subject-specific course book. To design the tasks, teachers select and adapt suitable published materials. Sometimes they also write new materials if they cannot find suitable existing materials. When selecting or creating appropriate written or visual materials, the language level of the students should be considered (Schuman Fauster & Fürstenberg, 2022). This means that the ESP course for landscape architects at the university is based on the needs of the students and the suggestions of landscape professionals, with the planning of the course being process oriented.

Overall, the needs of the university are the teaching/learning of subject-specific vocabulary and the reading and analysing of scientific texts. In addition, the teaching/learning of content and language are intertwined; the ESP course takes a two-strand approach. On the one hand, the course consists of the teaching/learning of professional vocabulary related to landscape architecture and urban planning, which helps to expand professional vocabulary, relate it to one's own context and understand scientific and professional texts; on the other hand, the course includes the analysis of professional texts, their translation and the search for professional information for academic discourse. In addition, the ESP study course aims to develop students' communicative and professional competences, where communicative competence is the ability to use language at both receptive and productive levels, and professional competence is the ability to use professional vocabulary in written form (when producing translations and academic papers) and orally (when participating in academic discourse, giving presentations, creating dialogues, etc.) when participating in professional and academic activities.

According to the new 21st century paradigm, students need to be taught 21st century skills, and in line with Oxford University,

"... Global skills can be understood in five broad clusters:

- Communication and collaboration.
- Creativity and critical thinking.
- Intercultural competence and citizenship.
- Emotional self-regulation and wellbeing.
- Digital literacies.

... They prepare students for success, not only academically and professionally but also personally." (Mercer et al., 2019, p. 2)

ESP is particularly well suited to the development of global skills; 5 interconnected clusters of global skills are integrated into different ESP teaching/learning activities to acquire and extend professional vocabulary. Content-based language learning is the foundation of ESP. At the same time, the global skills are used and practised in the teaching/learning of subject-specific language.

In summary, the author's observations show that the successful acquisition of professional vocabulary for landscape architects can be achieved through a process-oriented approach in ESP, where several elements are linked and connected to ensure the successful acquisition of professional vocabulary. First, the ESP is based on meaningful self-regulated teaching/learning activities that can be carried out with student involvement in individual, pair, group and project work. Second, 21st century global skills are incorporated into the teaching/learning of professional vocabulary. Global skills support the acquisition of professional vocabulary and can also be an outcome of the student teaching/learning process in the ESP to enhance the professional and social competences that landscape architects need to meet the demands of the profession.

## Investigating Students' Opinion on Expansion of Professional Vocabulary

The survey was conducted at the end of the academic year in May 2024 to find out students' opinions on the expansion of professional vocabulary in the ESP course at the university. The questionnaire was distributed to 25 second year students on the "Landscape Architecture and Planning" course in their last ESP lesson before exams. The students were asked to evaluate 8 statements including 5 teaching/learning activities, 4 activity implementation methods, SRL and finally the students rated the effectiveness of increasing professional vocabulary.

- 1. I have learned new professional vocabulary by reading short texts and completing tasks under the guidance of a lecturer.
- 2. Reading of the EU Landscape Convention has helped me learn and understand the legal terminology in landscape architecture.
- 3. I have learned professional vocabulary by reading scientific articles on landscape architecture and urban planning in accordance with the given requirements and guidelines.

- 4. I have learned professional vocabulary by making a presentation and compiling an appropriate glossary about:
  - Garden styles in landscape architecture
  - Manor house surrounding
  - Attractive and ugly urban landscape / cityscape
- 5. I have learned professional vocabulary by creating a presentation on landscape architecture projects implemented in recent years in the world (Europe, the Baltic States, Latvia).
- 6. When learning professional vocabulary at ESP I prefer: 1. individual learning, 2. pair work, 3. group work, 4. project work.
- 7. I am able to set learning goals, plan and implement my own learning and I have reflected on how I have organized the acquisition of professional vocabulary.
- 8. I have expanded my professional vocabulary, that makes me easier to understand content.

A 4-point Likert-type scale was chosen to measure students' attitudes toward their teaching/learning activities, activity implementation methods, and the SRL. Students were asked to select a response on a point scale (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree), with normally no neutral points on the scale. This is to ensure that students indicate an attitude when expressing their agreement or disagreement with a particular statement. For the last statement of the questionnaire, a 10-point Likert scale (1 point=very low, 5=neither low nor high, 10=extremely high) was used, giving respondents 10 choices and allowing data to be obtained with greater precision (Kristapsone, 2014).

The results were analysed using descriptive statistics, which provide measures of central tendency, and Spearman's rank-order correlation method was used to test positive correlation which will be described in this section. SPSS 22-a software programme for the quantitative analysis of complex data - was used (O'Leary, 2010).

Firstly, the author analysed data of the Table 1, where five teaching/learning activities are indicated as statements (1-5), they were implemented to expand professional vocabulary in ESP study course.

able 1. Students Opinion About Teaching / Learning Activities (n=25						
Teaching / Learning Activities	Mean (X̄)	Median (Md)	Mode (Mo)	Standard Deviation (s)		
Statement 1	3.56 2.	4	4	0.50		
Statement 2	3.23	3	3	0.71		
Statement 3	3.52 3.	4	3	0.51		
Statement 4	3.64 1.	4	4	0.64		
Statement 5	3.28	3	3	0.68		

Further the description of each teaching/learning activity is given after each statement.

Statement 1: I have learned new professional vocabulary by reading short texts and completing tasks under the guidance of a lecturer.

The teaching / learning activity is based on the use of the course book, lists of words and phrases teach students key professional vocabulary. They focus on learning key words needed for professional communication, but this is not sufficient in all cases. The use of the course book shows that the key vocabulary is explained with each new topic to facilitate understanding of the content. The meaning of new words and expressions is explained with definitions and translations, and examples are given to show how the words can be used in context. Various speaking and writing tasks are used to develop students' ability to use words correctly. Word search, multiple choice, matching exercises and crossword puzzles are used to reinforce knowledge of the professional vocabulary. This activity received a relatively high average score—the mean is 3.56, indicating that students generally find it effective for expanding vocabulary.

Statement 2: Reading of the EU Landscape Convention has helped me learn and understand the legal terminology in landscape architecture.

This activity is based on language skills, use of dictionary. Students are given information about the use of legal terminology and were asked to find technical words, definitions and explanations of legal and subject-specific words.

The mean score is 3.23, which is lower than the first activity and the other activities, indicating that students have mixed feelings about the effectiveness of the activity. The highest standard deviation is 0.71, indicating that students' experiences with this method vary widely.

Statement 3: I have learned professional vocabulary by *reading scientific articles on landscape architecture and urban planning* in accordance with the given requirements and guidelines.

This activity is based on reading scientific subject-specific articles. Students select a scientific article, read it, analyse it according to the given guidelines and then summarise the main ideas. Students should prepare presentations and consult the presentation guidelines. They should use both academic English and subject-specific vocabulary. They should present key findings and a pre-prepared list of professional vocabulary. The activities mentioned promote 21st century skills: creativity and critical thinking, emotional self-regulation and digital literacy. The mean scored of teaching/learning activity is 3.52, indicating students' positive attitude towards this activity for vocabulary expansion, it is quite an effective way of learning.

*Statement 4:* I have learned professional vocabulary by *making a presentation and compiling an appropriate vocabulary list* in accordance with the given requirements and guidelines.

Landscape architecture academic staff were approached and involved in the design of the course. The activity consists of the following three components. During the academic year students work out three separate projects (presentations + subject specific vocabulary) after exploring three sites of their choice:

- Garden style design in landscape architecture
- Manor house surrounding
- Attractive and ugly urban landscape

These projects are based on the students' practical observations and experiences. They use subject specific language, take the opportunity to find relevant vocabulary, use presentation phrases they already know, create a presentation and use the relevant professional vocabulary, and the final activity foresees to give realistic subject-specific presentation. The activities train students for presentations in real life. They visit sites of manor houses and gardens to
explore, observe and describe the surroundings, take photographs and collect evidence of architectural and landscape aspects. 21st century skills: communication and collaboration, creativity and critical thinking, citizenship, emotional self-regulation and digital literacy are developed. At the same time, these skills support the implementation of activities.

This activity scored the highest mean 3.64, showing that students strongly appreciate this approach to learning vocabulary indicating strong positive attitudes among students.

Statement 5: I have learned professional vocabulary by working in a group to create a presentation on recent famous landscape architecture projects in the world (in Europe, the Baltic States, Latvia).

This teaching/learning activity is a group work, 3 students form a small group and implement a project work based on a real-life situation and evidence, use relevant vocabulary, group work should be done from idea to presentation of work, focus on collaboration and communication with other group members. This activity scored the lowest mean score 3.28.

It can be concluded from the data obtained that students highly value individual realistic profession related project works in which they have the opportunity to find relevant vocabulary to create new contexts and to create realistic profession related presentations that strongly encourage the use of professional vocabulary. The results show that students support working with the course book to acquire important professional vocabulary, and finally – reading and analysing of profession related scientific articles. This proves that students support creative individual work and the practical application of vocabulary in different contexts.

Secondly, the author analysed the activity implementation methods favoured by students to improve the professional vocabulary (Table 2). The data listed in Table 2 provide a brief overview of each method and the SRL for the acquisition of professional vocabulary.

Teaching (n=23)				
Activity Implementation	Mean	Median	Mode	Std.
Methods	( <b>X</b> )	(Md)	(Mo)	<b>Deviation (S)</b>
Individual learning	3.68	4	4	0.47
Pair work	3.28	3	4	0.84
Group work	3.08	3	4	0.95
Project work	3.36	3	4	0.70
Evaluation of SRL studies	3.44	4	4	0.71

Table 2: Students' Opinion About the Activity Implementation Methods of Teaching/Learning (n=25)

The results show that *individual learning* has the highest mean score of 3.68 and is perceived by students as the most effective method. The data on *pair and group work* show that students value both methods of delivering activities, but the lower mean scores suggest that they are less popular and less effective compared to individual learning. The higher standard deviation in both cases suggests that students' experiences of the two methods are very different. The mean of 3.36 for project work suggests that it is quite an effective method of learning, but the standard deviation of 0.70 suggests that it can be effective but is not always preferred by students. There is a lack of consistent enthusiasm.

The mean score for *SRL* is 3.44, which indicates a generally positive perception of it in the ESP study course and SRL is effective for increasing professional vocabulary. Overall, the

results indicate that students rate the individual activity implementation methods highly and then support the project work. SRL supports vocabulary expansion.

Third, students were asked to rate their progress in teaching/learning professional vocabulary. A ten-point scale was used to measure students' progress in acquiring professional vocabulary. The students had to self-assess their performance, the mean score was 8.08, then the score of the students' performance at the end of the academic year was calculated, it was 7.76. This self-assessment score is only slightly higher than the teacher's score.

The results prove that the teaching/learning activities and activity implementation methods used to carry out the activities were effective in increasing subject vocabulary. The results of the survey show that students are able to use the acquired professional vocabulary in various new ways, relate it to their own content and participate in academic discourse.

Fourth, the Spearman's rank order correlation method was used to test whether there is a correlation between vocabulary expansion and each teaching/learning activity, each activity implementation method and students' SRL. The degree of correlation was determined according to U. Kuckartz (Kuckartz et al, 2013) between:

- 1. Each teaching/learning activity and expansion of professional vocabulary
- 2. Each activity implementation method and expansion of professional vocabulary
- 3. Students' SRL and expansion of professional vocabulary

1. Teaching / Learning Activities to Expand			Correlation	
Professional Vocabulary			degree	
a.	Work with the course book	0.59	Moderate	
b.	Reading of the European Landscape Convention	0.64	Strong	
c.	Reading of the Scientific Article	0.69	Strong	
d.	Giving realistic subject-specific presentations	0.72	Strong	
e.	Presenting of the international landscape project	0.62	Strong	
2. Activity Implementation Methods to Expand				
Professional Vocabulary				
a.	Individual learning	0.39	Weak	
b.	Pair work	0.56	Strong	
c.	Group work	0.32	Weak	
d.	Project work	0.61	Strong	
<b>3. Self-Regulated learning (SRL)</b> 0.73 Strong			Strong	

Table 3: The Expansion of Professional Vocabulary

The data in Table 3 give evidence that the strongest correlation 0.73 is observed between students' SRL and professional vocabulary expansion, then a very strong correlation 0.72 is observed between project work and professional vocabulary expansion. A correlation (from moderate to strong) is observed between each teaching/learning activity and vocabulary expansion; a correlation (from weak to strong) is observed between each activity implementation method and vocabulary expansion.

It can be concluded that the acquisition of professional vocabulary is a long-term, processoriented approach that includes effective teaching/learning activities and activity implementation methods. Currently, the data obtained is used to assess the outcomes of all activities that support and promote the expansion of professional vocabulary during the academic year.

#### Conclusions

- Students highly value giving realistic subject-specific profession related presentations where they have the opportunity to find relevant vocabulary and create new content. The task strongly encourages the use of professional vocabulary.
- The students support the work with the course book to acquire important professional vocabulary, and finally reading and analysing the subject-specific scientific articles.
- Students support individual work and the practical application of the professional vocabulary in different contexts.
- The acquisition of professional vocabulary for landscape architects is a long-term, process-oriented approach that includes effective teaching/learning activities and activity implementation methods (most effective individual project work).
- The mean value or average assessment of students' learning performance is 7.76, with the lowest value being 5 and the highest value 10 demonstrating students' high ability to use professional vocabulary in various new ways, relate it to new contents, and participate in academic oral and written discourse.
- Self-regulated learning supports the expansion of professional vocabulary for landscape architects in the ESP studies at university, but there is room for improving certain aspects of teaching/learning activities and activity implementation methods (more group and pair work to develop communication and collaboration) to achieve better results in the expansion of professional vocabulary in the ESP study course at the university.

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## Bridging Technical and Academic English Studies in the Online Course for Post-graduate Engineering Students

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#### Abstract

Foreign language courses for academic purposes prepare students for the specific academic requirements at the tertiary level of education. English as the language of international exchange aims not only to improve students' level of English, but also to improve the language skills necessary for the academic environment. The study course "English for Master Students" at Latvia University of Life Sciences and Technologies is designed for the development of postgraduate engineering students' English academic writing and oral skills, and enrichment of the technical vocabulary. In the last few years, the blended approach has been applied in the study process with the additional learning material supplied in the estudies of the university's website accessible via the university's online platform. In 2024 the above mentioned course integrated an innovative self-study online course "Foundations of Academic English" worked out in the framework of the project "Digitalization initiatives for the improvement of study quality in the field of strategic specialization of universities" which offered self-study learning materials for developing academic English skills, including writing abstracts. The aim of the present research was to explore post-graduate engineering students' reflections on the efficiency and benefits of such a self-study online course in postgraduate engineering education. The research was based on the post-graduate students' survey and mini-focus group discussions. Overall, the results of both the survey and the focus group interview revealed that respondents' opinion about the online self-study course was very positive suggesting that self-study online courses can be effectively integrated into the syllabus in the framework of blended learning.

Keywords: Academic English, Engineering Education, Blended Learning, Online Self-Study Course

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## Introduction

Studying English for professional and academic purposes adds an international dimension to university programmes where study courses in engineering sciences for local students are implemented in their native language. Erasmus mobility has become an important characteristic of higher education, and English as the language of international exchange has found a stable place in the curricula of engineering sciences of universities across Europe.

The course "English for Master Students" at Latvia University of Life Sciences and Technologies is integrated into the master's degree programme for engineering students. The course is designed to prepare students for academic and research activities by focusing on developing skills necessary for reading and understanding scientific and professional texts in English, raising awareness of the genre of the publications of scientific papers, participating in discussions, writing for academic purposes, using and practicing professional terminology of the subject field in language tasks. Since the pandemic, a blended approach has been implemented using additional learning materials available on the "Moodle" platform of the university's website.

In 2024 the study course "English for Master Students" integrated an innovative self-study online course "Foundations of Academic English". The course was worked out in the framework of the project "Digitalization initiatives for the improvement of study quality in the field of strategic specialization of universities" funded by the European Social Fund (further: Digitalization Project). The aim of the project was to strengthen digital capacity and introduce digital initiatives in six Latvian universities, integrating technological solutions into the content and process of study courses. The main objectives of the project were the following: 1) strengthen and develop students' digital competences by integrating the latest digital solutions in the university study courses; 2) ensure development of students' digital competences; 3) strengthen the capacity of students in the use of artificial intelligence and machine learning. The online self-study courses in various subjects were available in the university's Moodle platform. As part of this project, the authors of the article piloted the self-study online course "Foundations of Academic English" (further: the self-study online course) developed on the Moodle platform by colleagues from another university. During one semester in 2024, two groups of postgraduate engineering students participated in this blended learning course, which combined online and on-site learning.

It seemed worthwhile to evaluate the benefits or drawbacks of the Digitalization Project initiative of integrating a self-study online course into the syllabus of the study course "English for Master Students". Therefore, the aim of the present research was to explore post-graduate engineering students' reflections on the efficiency of such a self-study online course in post-graduate engineering education.

## **Theoretical Overview**

English for Academic Purposes (EAP) refers to teaching and learning English as a foreign language in the academic context encountered in university settings. Its main aim is to facilitate learners' studies or research activities through the medium of English (Flowerdew & Peacock, 2001; Hyland, 2006; Paltridge & Starfield, 2013). It is considered a branch of ESP (English for Specific Purposes) which has recently expanded together with the growing number of Erasmus+ mobility opportunities and international students studying in English in European universities.

As EAP is designed to provide learning materials to study or conduct research in English, it refers to a wide range of academic activities including (Gillet & Wray, 2006): 1) preuniversity, undergraduate and postgraduate teaching (from materials design to lectures and class-room activities), 2) classroom interactions (tutorials, feedback, seminar discussions, etc.), 3) research genres (journal articles, conference papers, grant proposals, etc.), 4) student writing (tasks, exams, theses, etc.). The language content is focused on academic discourse, the syllabus is based on needs analysis and designed to enhance task performance in academic contexts which determines the language structures (Alexander et al., 2019).

The Academic English course at Latvia University of Life Sciences and Technologies is integrated into the curriculum of the master's degree programs for postgraduate engineering students, where the focus is on learning professional terminology related to engineering subject fields and applying the theoretical concepts in practical tasks, the development of knowledge and skills necessary for the reading of scientific and professional texts in English, listening to reports and discussions which is then followed by giving the feedback by speaking and writing for academic purposes.

In the last few years, the blended approach has been applied in the study process with the learning materials made available through the university's e-studies platform.

Blended learning combines online educational materials with traditional in-person classroom methods. The advantages of blended learning are widely described in scientific literature, they include: improving student motivation, promoting active participation, enhancing autonomy and teamwork, creating new forms of interrelation between teachers and students, allowing greater flexibility and accessibility, boosting digital intelligence, and potentially improving student learning outcomes (Pizzi, 2014, Megahed & Hassan, 2022, Sinkus & Ozola, 2022).

## Methodology of the Research

This research evaluated the suitability of the Digitalization Project's online self-study English course for post-graduate engineering students integrated into the syllabus of the university's study course "English for Master Students". The post-graduate students' English language proficiency level ranged from B1 to C1 (most students had level B2).

The structure of the project's self-study online course "Foundations of Academic English" is very well designed. It comprises five units covering key topics such as characteristics of Academic English, cohesion and coherence of academic discourse, academic vocabulary, genres in academic writing, an abstract, explanations of English grammar rules. The students' native language is not used in the course, all instructions and learning materials are provided in English. Each unit includes the following:

- 1. A video with a narrated presentation in each unit (approximately 10 minutes long),
- 2. A quiz: digital lab practice,
- 3. Links to supplemental sources,
- 4. A unit quiz.

The course content was introduced and discussed during in-person seminars, while the activities of the self-study online course were completed on the Moodle platform during lessons and assigned as homework. The settings of quizzes allowed students to have several attempts to improve their scores and to consolidate their learning.

The research was designed in two stages. Firstly, the opinion of post-graduate students of engineering sciences was researched. It was decided to focus on one unit of the course, namely, on writing an abstract as a genre of academic writing. Students were administered an online questionnaire consisting of five questions in the anonymous online survey (Google Forms). The respondents (n=61) were asked the following questions:

- 1. Did the online presentation content effectively help you develop knowledge and skills in abstract writing?
- 2. Was the language and terminology in the online presentation clear and understandable?
- 3. Was the online presentation appropriate for your background and knowledge level?
- 4. Were the terms clearly defined?
- 5. Please rate how useful the online presentation was.

The second stage involved one mini-focus group discussion in October, 2024. Mini focus groups normally involve three to six people (Litosseliti, 2007, Oates & Alevizou, 2018). During group interviews and focus group discussions with people who do not feel comfortable in face-to-face interactions, focus groups offer a more 'safe' and informal environment where participants can share views, experience, beliefs, and attitudes in a free and open discussion about a particular topic (Krueger & Casey, 2015). Post-graduate engineering students expressed their reflections and feeling regarding the effectiveness of the self-study online course for acquiring knowledge of writing abstracts. The research question is the following: Is the integration of Academic English self-study online lessons in the post-graduate study course «English for Master Students» relevant in post-graduate engineering students' opinion?

#### **Results and Discussion**

The results of the online survey show that the respondents have a positive opinion of the online course. A significant 91.8% of the students gave a positive answer to the first question if online presentation content effectively helped them develop knowledge and skills in abstract writing. Regarding the questions of whether the language and terminology, as well as the online presentation, were appropriate for their background and knowledge level, 93.4% and 98.4% of respondents, respectively, answered positively (Fig.1). It is necessary to mention that the voice-over and instructions of the course were in the English language, but it did not hamper the learning process.

Survey Question	Percentage of Positive Responses
The online presentation content helped develop knowledge and skills in abstract writing.	91.8%
The language and terminology were appropriate for the students' background and knowledge level.	93.4%
The online presentation was appropriate for the students' background and knowledge level.	98.4%

Figure 1: Respondents' Evaluation of the Difficulty Level of Digitalization Project's Self-Study Online Course

The results are somewhat surprising therefore more detailed explanations were expected during the focus interview later. The question, if the terms were clearly defined, received 90.2% answers "Yes". The question was to find out if engineering post-graduate students could easily grasp the meaning of linguistic terms used in the explanations but the evidence witnesses that they could understand everything. It should be noted that the online learning material served as the support material for the topics studied during the face-to-face classes, and the explanations were received before doing online self-study activities.



Figure 2: Respondents' Evaluation of the Usefulness of the Digitalization Project's Self-Study Online Course (the Evaluation Scale From 1 to 10, Where 1 Is Very Bad, 10 Is Outstanding)

In the last question, respondents were asked to rate the usefulness of the online presentation on the scale from 1 to 10, where 10 is outstanding, and 1 is very bad. It can be concluded the total of 75.4% of respondents gave scores from seven to ten thus confirming that the learning process was successful and helpful (Fig. 2). Another reason for such positive opinions is that present-day students are called Generation Z or post-millennials. It is a generation that grew up in the age of the internet and digital technologies, they are accustomed to engaging with videos and different online instructional materials found on the Internet.

Table 1. The Summary of the Focus Oroup Interview			
No	Students' reflections regarding the self-study online course	Positive/Negative	
1	Knowledge of how to write abstracts, academic vocabulary	Positive	
2	Good quality of online learning materials	Positive	
3	Good structure of the course	Positive	
4	Online material is more understandable and easily accessible	Positive	
5	Insufficient English knowledge of learners for online self-study	Negative	

Table 1: The Summary of the Focus Group Interview

During the second stage after having summarized the above-described findings, the authors carried out the study by conducting a mini-focus group discussion. The students' spoken responses were analyzed to identify key factors reflecting their attitudes towards the online course. Some positive feedback from the interviews included the following quotes: "I will use the acquired knowledge in writing abstract; online learning material is more understandable and more easily accessible than simple texts or "paper" tasks; I learned more about academic writing which was presented in good quality, it went step by step through the information and made me look up and translate some words which I did not know". However, there were some negative opinions, such as: "It was useful, but the presentation form was rather uncomfortable to use, I would have preferred a readable format, not a video", "If my English skills were better, then an online lesson wouldn't be a problem. It's hard to

express myself without vocabulary and basic knowledge, it took me hours to complete the unit quiz".

The analysis of the focus interviews leads to the conclusion that, according to the respondents' opinion, they acquired the necessary knowledge because the online self-study course had a good structure, and high quality, it was easily accessible, students could take time and go step-by-step, however, if students had insufficient English language proficiency, the course proved to be a challenge and thus not very effective.

## Conclusion

Overall, the results of both the survey and focus group interview revealed that post-graduate students' opinion about the online self-study course was very positive. Present-day students are at ease with digital technologies and appreciate online learning materials developed by the teaching staff. However, some of the answers in the focus group interview gave evidence that a negative attitude towards online learning might be caused by insufficient English proficiency level as well as the dislike for the online format. The authors recommend introducing a new topic and explaining the vocabulary during face-to-face lessons in order to support students in their individual online learning activities to achieve better results. The self-study online course for post-graduate engineering students can be effectively integrated into the syllabus of the university's study course in the framework of blended learning.

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#### Embracing Communicative Activities on the Way to Becoming Creative Thinkers

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> The Barcelona Conference on Education 2024 Official Conference Proceedings

#### Abstract

This interactive session aims to address the importance of communicative activities in promoting creative thinking in the classroom and beyond with an understanding that these two are profoundly intertwined. In essence, creative thinking and communication skills are symbolic - they support one another to achieve maximum influence. While creative thinking produces ideas, communication skills enable individuals to share and cultivate those ideas efficiently, hence transforming creativity into tangible outcomes and promoting meaningful connections with others. A cognitive neuroscientist, Roger Beaty (2020), offers insights into the mechanisms highlighting that brain activation patterns differ depending on communicative actions. Beaty's work signifies a growing understanding among neuroscientists of how the brain supports creative thinking, paving the way for potential breakthroughs in enhancing creative abilities. Thus, in our session a connection will be made between current research findings and the need for the implementation of a variety of communicative activities such as role plays, discussions, drama, collaborative projects, creative writing activities and others. Overall, this workshop will share the various ways in which we, a team of instructors, help undergraduate students of a private Armenian university enhance their communication skills through the application of creative thinking. In the spirit of the workshop, attendees will be provided with a brief overview and demonstration of the tools referenced above and will have an opportunity to participate in group activities, design their own, and share opinions by suggesting how the addressed activities would promote creative thinking and problem-solving skills among learners.

Keywords: Creative Thinking, Communication Skills, Language Teaching

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#### Introduction

The importance of the implementation of communicative activities in the classroom has long been a central topic among those teachers who have embraced the truth that language is a communication tool, and as such it should be used directly for communication. To do that successfully in the classroom, learners need to be engaged in real-life, authentic activities (Nunan, 1988), which, interestingly, show a very strong relationship between communicative activities and creative thinking. In this article, we see this symbiotic relationship as a connection that can help students enhance their learning and their knowledge in all language skills.

A brief discussion on recent findings on how challenging communicative tasks can enhance creative thinking will be followed with suggestions of activities suitable for the purpose mentioned above.

#### The Relationship Between Communicative Activities and Creative Thinking

Creativity is present in every aspect of human life, from the reasons that an eight-year-old brings to their mother to play a computer game to groundbreaking discoveries and scientific breakthroughs, such as nanotechnology or ChatGPT. While creativity per se remains a mystery yet to be discovered, neuroscience offers insights into the understanding of the mechanisms that lie behind creative thinking. Through a discussion of experiments involving brain imaging and observations of behavior in different contexts, Beaty (2020), a cognitive neuroscientist, claims that creativity demands a cognitive effort - in part, to conquer the distraction and 'stickiness of prior knowledge.' According to him, creative thinking can be explained by the relationship between the brain's memory, which encompasses knowledge and background, and control systems, which help the brain to look for new implementations for the existing knowledge, thus searching for new possibilities.

Most interestingly, through brain imaging and a number of experiments, Beaty and his colleagues have come to the conclusion that the process of creative thinking helps brain networks, which would usually work in a separate manner, to function in unison. In other words, Beaty (2020) explains that two processes, idea generation and idea evaluation are involved in the process of creativity.

Idea generation can be defined as a 'free thinking' process. Have you ever caught yourself on the idea that you have been thinking about nothing and everything, reaching from the teapot in your kitchen to tea plantations and astronauts? Astronauts? Maybe you were thinking about how they drink tea in zero gravity!!! According to Beaty (2020) and other scientists, this is the stage when ideas are generated. In our activities we call it brainstorming!

The next process is idea evaluation, and in this case other parts of the brain - those that are responsible for cognitive processes - are active. And this is the stage when generated ideas get filtered. Interestingly, when the idea generation process is active, the idea evaluation process is dormant, and vice versa. However, as it has been mentioned above, the experiment conducted by Beaty (2020) and his colleagues comes to prove that both processes worked actively together among those participants of the experiment that showed higher results in creativity. This comes to confirm the findings of a study conducted earlier by Egorova et al (2015) which stated that several cortical areas of the brain both in the right and left

hemispheres get activated. What does this mean to us as teachers and facilitators? Perhaps, it is worth going through creative processes and then discussing them together.

Following the advice of a well-known Hungarian-American psychologist, Csikszentmihalyi (1990), who noted that the motivation to do something because it is deeply fulfilling and personally daunting drives the highest levels of creativity, the authors tried to investigate how communicative activities can lead to creative thinking.

#### **Bringing Communicative Activities Into Language Classroom**

For a concise summary, the article provides a comprehensive overview of the activities and methodologies showcased during the workshop that offer teachers implementable insights to apply in their own teaching practices. The activities presented below address the purpose each one serves and step-by step descriptions.

#### **Candy Talk**

## Purpose

The activity is intended to serve as an excellent warm-up at the start of a course or class. It aims to enhance students' communication skills, namely through speaking.

#### Description

Four different types of candies are offered to students. They are asked to choose a candy and enjoy it. Then, they get into groups and depending on the type of the candy chosen, students answer one of the questions below:

- Candy 1 The origin of your name
- Candy 2 An interesting fact about you that most people do not know and that you would like to share now

Candy 3 - An unusual hobby you would like to take up

Candy 4 - FREE CHOICE

The current activity can be tailored to suit the course, its objectives and other factors such as students' level, interest, age and so on. It can also lead to another creative activity, that of designing an advertisement for candies.

#### Candy Advertisement

#### Purpose

This task is crafted to cultivate students' argumentation and persuasion skills as well as foster creative thinking.

#### **Description**

Students are asked to come up with a new design for the candy at hand and a tagline that would tempt others to try it. Further, students present their newly created designs and taglines to the entire group. This can be done by displaying their work on the board, enabling everyone to view and discuss their creative ideas shared. Creating advertisements means bringing a communicative authentic activity into the classroom the importance of which has been addressed by Buendgens-Kosten (2014). Taking this into close consideration, another related activity is suggested below.

#### **Creative Advertisements**

#### Purpose

This specific activity aims at developing summarizing skills through writing slogans, boosting creativity and exercising collaboration skills.

#### Description

Students are given photos of strange inventions, such as a hug-me pillow, baby mop, umbrella hat, hair rollers, and others. In groups of three to four, they are tasked with designing a creative advertisement with a compelling slogan. After completing their advertisements, each group will present their work to the entire audience. The instructor has flexibility to modify the task based on a variety of factors, including the students' proficiency level, the specific objectives of the lesson, the subject matter being covered and more. Interestingly, the more challenging the activities are, the more engaged the students are. Following this premise and guided by PBL (Project-Based Learning), an intensive four-week group project is described below.

## **Creating Parody or Pastiche**

#### Purpose

This project serves a dual purpose - to enable students to analyze a genre and determine its key components as well as standard conventions. It is also a good exercise to express creativity.

#### Description

As a group, students select a specific genre that they would like to pastiche or parody in this assignment. They might ask what the difference is between a parody and a pastiche. Parodies are more mocking, making fun of the genre's dumbest clichés, while pastiche imitates various sources in a more respectful way, borrowing some of a genre's conventions and clichés without making fun of them (Hudson, 2017). As they make this selection, they have the freedom to work in many modes (e.g. producing a magazine cover, website, news article, mini-movie, television commercial and so on). Students collaborate in groups to create a parody or pastiche of the chosen genre. To do this, they should pay attention to small details, especially those involving the genre's characteristic lexicon, language structures and rhetorical patterns as well as audio, video, and/or visual composition. The projects are showcased to the whole class through detailed presentations lasting around fifteen minutes.

## Take-Away Alphabet Rap

## Purpose

The current activity seeks to enhance creativity, in addition to linguistic and critical thinking skills. It also fosters confidence and collaboration as students create their own alphabet rap and perform the song for an audience.

## Description

Students listen to a fun and challenging tongue-twisting alphabet rap performed by Daniel Radcliffe. This serves as inspiration and a warp-up to compose their own unique alphabet song, incorporating 5-6 consecutive letters of the alphabet and crafting lines with 4-5 segments/words for each. Once the songs are complete, students present their songs to their peers in a rap battle.

## Conclusion

This brief overview provides a hands-on toolkit of communicative activities for teachers and facilitators who aim at promoting creative thinking in their classrooms. It is undeniable that communicative activities help to connect information in new and meaningful ways. If we come back to Csikszentmihalyi's (1990) claim that personally challenging ideas inspire the highest level of creativity, we will probably agree that communicative activities give this opportunity and should be extensively implemented in the classroom.

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#### Pedagogy in Higher Education: Paradigmatic Reinvention of Learning Processes

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#### Abstract

In a context of major transformations affecting higher education, it is important to (re)think about pedagogical environments that enable students to reflect critically and autonomously on their learning processes, in the context of their initial training. This study is an opportunity to identify students' perceptions of the methodologies implemented by a group of initial teacher training teachers at the University of Madeira (UMa). The research methodology is a qualitative approach, a case study with a class of students from the Masters in Pre-School Education and Teaching of the 1st Cycle of Basic Education (MEPEE1CEB). Their answers to a survey were subject to a content analysis and a triangulation between the theory and the representations of the research subjects. It is concluded that the students' representations show that the course teachers still use traditional practices, but there are already revealing indications of more decentralized practices based on the empowerment of students (Freire, 2014) by some teachers, which motivated them to learn, with positive consequences on their academic results. Contemporary pedagogical thinking points to the imperative need to transform higher education, aiming at the creation of true learning environments, and spaces for creativity and pedagogical innovation, respecting the diversity and individuality of each student, through "pedagogical strategies beyond the traditional lecture and the current transmission model" (UNESCO, 2022, p. 58). It is important to reimagine new pedagogical approaches, giving the student a prominent role in the learning processes, which thus become the driving force of this system.

Keywords: Pedagogy, Higher Education, Learning Processes

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## Introduction

In this research, we reflect on Pedagogy in Higher Education (HE) and the paradigmatic reinvention of learning processes, in a context of major transformations and reforms, resulting from international policies, marked by the global economy. In recent decades, the large influx of students with diverse paths and trajectories, the policies and guidelines resulting from the Bologna Process (PB) with implications for curricular and pedagogical practices, have placed HE under great pressure, demanding "a role increasingly diverse, open and committed to society" (Guerreiro, 2022, p. 1).

In Europe, the implementation of PB resulted in the redefinition of lines of action and the implementation of new practices that focus on the student and their diversity, improving the quality and variety of the training offer and guiding students with a view to developing essential skills for an uncertain and changing job market (European Higher Education Area, 2009).

From a pedagogical-didactic point of view, the PB discourse frames the paradigm that conceives the student as an active subject in the teaching-learning process, placing "new demands on teachers' modes of pedagogical work" (Leite & Ramos, 2014, p. 75).

And in this way, pedagogy has gained visibility, and teaching work traditionally based on traditional practices has been questioned. "Discreetly," the discussion around learning, that attributes a new status to the student, has supported other pedagogical approaches and the implementation of new teaching and learning methodologies, as well as the reference of other requirements associated with pedagogy.

New spaces for discussion are opening and the quality discourse that breaks with the teaching paradigm, replacing it with that of learning (Decree-Law n.<sup>o</sup> 74/2006) gains visibility. In other words, as Leite and Ramos (2014) recognize, teachers began to live with the tension between the search for teaching practice, in which the student is the subject of the teaching-learning process and the difficulties of implementing this teaching while meeting the demands competitiveness, arising from market logic.

It was within the framework of these major transformations that affect HE, that we dared to reflect the pedagogy in the pedagogical spaces of initial teacher training and the paradigmatic reinvention of learning processes, which "timidly" is being spread in the discourse on the quality of HE.

Based on this issue, we present the narrative of a study carried out at the University of Madeira that aimed to study pedagogical environments in initial teacher training, based on the perceptions of a group of students about the learning processes implemented, regarding the methodologies used in the initial training of teachers at University of Madeira.

The article presents an analysis of pedagogy in ES based on an empirical study that involved initial teacher training students at this University.

The narrative text that presents the study is organized around 5 thematic dimensions: i) Pedagogy in Higher Education; ii) The learning environments in initial teacher training that support the practices implemented with students; iii) The methodological options adopted; iv) Presentation and discussion of results; v) The conclusion.

## Pedagogy in Higher Education

The interest in university as a space for making training decisions is, according to Zabalza (2002), very recent, as it was only from the 90s onwards that studies on pedagogy in ES were consolidated through quantity and increasing quality (Esteves, 2008).

For the author, talking about HE pedagogy means talking about science about teaching and learning, and about science about teaching and learning. However, the evidence emerging from the evaluation reports points to knowledge contained in manuals, which is presented to students, as opposed to "knowledge to ask based on pertinent questions and the search for valid answers, anchored in true communities of learning made up of teachers and students that, strictly speaking, all higher education institutions should be" (Esteves, 2008, p. 103).

The massification of HE validated "the training of merely executive staff who act in accordance with established knowledge" (Esteves, 2008, p. 103), as opposed to the training of creative staff with critical thinking and problem-solving skills. Gradually, some increasingly sophisticated assessment systems are identifying as centers of excellence that focus on training for the development of emancipatory skills oriented towards a critical perspective (Freire, 2014), promoting student autonomy.

In another study promoted by the European Forum for Enhanced Collaboration in Teaching (USA, 2019), cited by Almeida et. al (2022, p. 7),

a set of guiding principles for pedagogical practices is explained, highlighting the centrality of the student and their characteristics and needs, and academic training not limited to the technical and scientific aspects, which includes critical, creative and resolution thinking skills of problems, diversity and complementarity of strategies with a view to expected learning results, cooperative learning and work in teams or learning communities.

The emergence of new learning scenarios in ES seems inevitable, legitimizing the reconfiguration of pedagogical practices and the promotion of the development of specific disciplinary skills and transversal skills, within the framework of reflective, dialogic approaches, guided by values of a humanistic and democratic nature.

However, fragmented curricula and teaching practices proliferate that do not involve students in the construction of knowledge and the development of lifelong learning skills. Despite advances, "institutional structures and mechanisms to support innovation in teaching are relatively scarce, as are opportunities for pedagogical training for teachers" (Almeida et. Al 2022, p. 8). It is therefore urgent to promote a culture of Pedagogical Innovation, already referenced as a quality parameter for institutions.

## Learning Environments in Initial Teacher Training

Postmodernity requires Higher Education Institutions (HEIs) to renounce old pedagogies and "think and act outside the box" (Pereira & Fraga, 2024). Globally, "innovative environments are called for, simultaneously disruptive, capable of reimagining current pedagogical approaches, recognizing the student and the learning processes as the driving force of the system" (p. 2).

Nevertheless, the creation of these new learning environments is an arduous task, in which, in the disruptive framework that is envisioned, the idea of the emergence of pedagogical innovation as a context for educational change gains some consistency. The creation of innovative learning environments is everyone's responsibility and can take different formats that revolutionize pedagogical intervention spaces. According to Freeman et al. (2017):

Pedagogical approaches that Shift the paradigm from passive to active learning help students to develop original ideas, improve information retention, and build higher order thinking skills. These approaches include problem-based learning, project-based learning, challenge-based learning, and inquiry-based learning, which encourage creative problem-solving and actively implementing solutions. (p. 10)

Also Toffler (1998) reimagining educational institutions with varied arrangements, namely, "(...) Rooms with several teachers and a single student; rooms with several teachers and a group of students; students organized into task forces and project teams; students moving from work groups to individual or independent work" (p. 328), anticipates the emerging break in the current paradigm and the need to respect the pace of each learner, their interests and motivations, as well as respect for diversity. UNESCO also confirms special attention to this need:

(...) reorienting education so that it gives everyone the opportunity to acquire the Knowledge, skills, attitudes and values needed to contribute to sustainable development. This requires substancial changes in what is taught and how it is taught. ESD (Education for Sustainable Development) entails integrating into the curriculum critical issues such as climate change, biodiversity, disaster risk reduction and sustainable development agenda. (UNESCO, 2014, p. 47)

Assuming the urgency of building innovative learning environments, the future of HE renewal involves recognizing how humans learn and implementing "pedagogical strategies beyond the traditional lecture class and the current transmission model" (UNESCO, 2022, p. 58). In fact,

Cooperative work between students, the development of research projects, problem solving, individual study, seminar dialogue, field study, writing, action research, community projects – these and many other pedagogical forms – must be present in higher education. To bring pedagogy back to the forefront, it is necessary to give greater value to the teaching work of teachers and support their pedagogical learning and growth. (UNESCO, 2022, p. 58)

This reorganization proposal converges towards a vision of emancipatory pedagogical innovation, contrary to the traditional approach, which is extremely regulatory of all pedagogical action, and which foresees structural changes in the reconstruction, organization and systematization of knowledge, which lead subjects to transformative and emancipatory learning (Freire, 2014).

Founded on ethics, respect for the dignity and autonomy of students, through a horizontal relationship that promotes curiosity and critical capacity, Freire's proposal induces subjects to learn that transforms themselves, their educational and community spaces and consequent emancipation (Macedo et al., 2001).

In the work Pedagogy of Autonomy Freire (2014) highlights the positivity of an inclusive education, supported by pedagogical autonomy and respect for the knowledge of students and relegates all teaching and the act of teaching, linked to the training of technical skills of neoliberal inspiration.

## Methodology

In this investigation, we opted for qualitative research, as it was the one that best suited the research objectives, and because of the possibility of describing, clarifying the meanings and meanings of the subjects: students of the master's degree in Pre-School Education and Teaching of the 1st Cycle of Education Basic (MEPEE1CEB).

The research participants are 16 MEPEE1CEB students at UMa. An online form was created on the Google Forms platform with the Questionnaire Survey questions, which reached the subjects via email. Of the questionnaires sent, 16 were answered.

Based on a case study (Yin, 2003), we look at the phenomenon under study in its natural context, seeking to identify the various interactive processes related to the place of Pedagogy in ES to understand its phenomenology.

The data collection technique was the questionnaire survey. This technique was considered due to the need to access the largest number of students and to refine the pedagogical models and practices implemented in the context of initial training provided by UMa's MEPEE1CEB.

The content analysis carried out allowed us to reveal the representations of the research participants regarding the learning processes present in the pedagogical contexts of initial training.

The content analysis of the data collected, according to Bardin (1995), allowed the refinement of the representations of those involved and the alignment of predominant conceptions about the place of pedagogy in the HE institution where the research took place.

## Presentation and Discussion of Results

A group of 20 students from the master's degree in Pre-School Education were asked 5 questions and answered 16.

The research methodology consists of a qualitative approach, in a case study with a class of 16 students from the Masters in Pre-School Education and Teaching of the 1st Cycle of Basic Education (MEPEE1CEB). They responded to a survey and their responses were subject to content analysis and data triangulation.

# 1 - How do you characterize methodologies operationalized by teachers who teach the Curricular Units (CU) that make up the study plan of your course?

Of the 16 responses obtained, 8 students stated that the methodologies implemented by teachers were appropriate and positive. Each of these students had another opinion about them, resulting in these ideas: "varied, adapted to the needs of students, logical, supportive of the internship, based on independent study and combining ideas, thoughts, knowledge,

encouragement of reflection critical of students, link theory with practice, use active approaches and develop in learning communities" (e.g. collaborative work and case studies).

One of these students admitted that some teachers continue to implement traditional methodologies, and another student said: "Although the course offers a solid theoretical basis, there are important gaps in practical training, which limits our preparation to face the real challenges of practice."

On the other hand, 8 students expressed a different opinion, stating that the methodologies used are "traditional, expository, don't make sense" (teachers give classes, where they tell you to do the opposite of what they do), are based on presentations and use of documents and "are not adjusted to the interests of students." They suggest "more collaborative methodologies, diversification of approaches," incorporating interactive activities, "such as practical projects to promote more engaging and effective learning."

However, one of these students states that she notices "some changes that promote more engaging and traditional learning."

# 2 - Do the learning scenarios of the UCs you attended or are attending on your course use a traditional or innovative approach? Justify.

6 students responded that most scenarios are traditional, although there are attempts at innovation, 5 stated that they were innovative, mainly in the master's degree than in the undergraduate degree, although of these, 2 recognized that not all of them are. 4 stated that there is a balance, that is, around half of the teachers seek to innovate, but others still create traditional scenarios.

# 3 - Give examples of the most common class structures, in line with the methodologies previously reported.

Half of these students (8) responded that classes are based on PowerPoint presentations, presentations of theoretical content, practical exercises and planning, taking into account the theory presented, written work, theoretical tests. 4 students highlighted other more active and practical approaches, such as: group work, research, debates, to enable "active participation, critical reflection and the application of knowledge" However, 2 of these students mentioned that part of the class is expository and the other part consists of collaborative work, practical moments, studies and case studies, based on more active dynamics. 2 students highlighted the challenges of carrying out research projects.

# 4 - Do teachers usually encourage critical reflection and active participation during classes? Give examples of concrete actions implemented by teachers.

All students said that some teachers encourage critical reflection, as they ask for their opinion and seek to awaken interest and motivation, asking questions about real situations and other subjects. "I have a teacher who asks our opinion, using what's called popcorn, which makes us participate and pay close attention" "promote group discussions or debates on topics (...) and challenges to reflect on real cases." 7 of these students recognized that not all teachers call for critical reflection and one of them stated that it happens more in the master's degree.

5 - During your academic career, in Higher Education, can you identify UC where student autonomy, the development of critical thinking and the student's active role were provided? Explain the dynamics of this.

Mathematics didactics (6), internships (5) and the curricular unit on technology and pedagogical innovation (4) were the CUs most mentioned by students. "In mathematics teaching, we had an active role and critical thinking. The discoveries came from us until we reached conclusions." In most UCs related to pedagogical practice, an attempt was made to promote student autonomy through the creation of plans and debates on various topics." "The curricular unit on technology and pedagogical innovation was based on the creation of a weekly weblog."

Other curricular units were also mentioned: mathematics VI; curricular development in the 1st cycle of basic education; mathematics I; mathematics V; specific didactics of mathematics; specific didactics of Portuguese; specific didactics of the study of the medium; theory and curricular development; Plastic expression; expressions seminar; specific didactics of expression; dramatic expression; musical expression; Portuguese IV.

From the answers obtained, it is possible to see that half of the students consider pedagogical work environments to be traditional and the other half believe that there are innovative environments. This process of change is not simple. In fact, more than a place to acquire techniques and knowledge, teacher training is the key moment in teacher socialization and respective professional configuration (Nóvoa, 1991).

It's important to (re)thinking the pedagogical environments that promote new perspectives on learning processes, reflective practices, critical thinking and new forms of autonomous work among students in the context of initial training.

Higher Education (HE) is not at the mercy of the acceleration that is going through contemporary societies. It has consequences for teaching and learning processes, whose pedagogical intervention strategies must respond to the needs of an increasingly mass and heterogeneous public (Pedrosa, 2001).

Some ground has already been covered towards new pedagogical practices, but there is still a long way to go, because changing paradigms is a slow and complex process. As recognized by the CNE (2022):

Exploring contexts where learning is meaningful, with impact and quality, constitutes a challenge for pedagogy. There is consensus on the need to evolve towards a model of student autonomy, abandoning the expository, passive model, based on the deeprooted dependence on retaining only what is presented. Students are required to have new skills: filtering information, interpreting, identifying false ideas, having critical sense and creativity and a sense of personal agency that drives action. To achieve this, students need new teaching models, with an understanding of phenomena and articulation of knowledge, which provide constant feedback and spaces for collaboration and reflection. (p. 97)

#### Conclusion

This article analyzed pedagogy in ES based on an empirical study involving initial teacher training students at the University of Madeira and the conclusion is that the echoes of contemporary pedagogical thought point to a learner who is the subject of his learning, an active participant in the construction of a curriculum tailored to his needs, with respect for diversity and individuality, hoping for the transformation of the school and the university, which become the to be places of dialogue and critical reflection, a habitat for creativity and pedagogical innovation.

However, this process is complex and requires time and hard work for teachers to appropriate the new principles that should guide their practices and the need to transform them to place the student at the center. Therefore, the pedagogical training of HE teachers is urgent, "which is intended to be current, cohesive and competitive" (Marques & Pinto, 2012, p. 130).

In fact, teacher training is one of the possible answers to make professional renewal possible. However, it is also essential that teachers can understand the reasons for this change and believe in its possibilities.

Pedagogy is a significant area of focus for higher education teachers who need to rethink their methodologies. The lecture, tests and theoretical classes are still an accepted teaching approach, and many students still spend their class hours passively taking notes while the teacher presents theory. Pedagogy allows teachers to understand how students learn and apply more active approaches, giving the main role to students. In this sense, pedagogy can make a difference in promoting meaningful and golden learning. It is about focusing attention on each student's ways of learning to adapt strategies to enable learning and see themselves as a facilitator and guide rather than a transmitter of knowledge.

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## Experiencing Group Development and Its Impacts Among Tertiary Students: A Qualitative Inquiry

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#### Abstract

Tertiary students are often exposed to group academic activities to learn critically important skills that contribute to student success. While navigating groups and working towards group goals, these students also learn valuable lessons and insights that lead to the development of 21<sup>st</sup> century skills like communication, collaboration, social skills, and social responsibility which are crucial to be learned as part of their preparation for work. This study aimed to explore students' experiences and learnings in group development and achieving group success. Using Content Analysis, with (n=30) college students, the researchers analyzed reflection essays of students to understand their experiences during a Group Dynamics class while accomplishing a group project based on Tuckman's model. Findings show that students have attained both individual and group learning as they navigate group activities. In addition, some of the student's experiences and learning are similar to the theory of Tuckman while other findings appear to be novel for their context. Implications of this study can help students at the tertiary level navigate groups better and attain group success. Professors can also take into consideration activities that help students develop critical skills to prepare them both as an individual and as a group member.

Keywords: Group Development, Group Dynamics, College Students, 21st Century Skills

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#### Introduction

Collegiate institutions through classroom activities prepare students as part of the workforce. As such, one of the critical skills needed to thrive in the 21st-century work environment is the ability to work with teams and teamwork. In the study of Bustos (2024), he discussed how certain skill sets need to be addressed to prepare college graduates for entering the labor market. Furthermore, he mentioned the need to strengthen the linkages between the labor sector and education through the improvement of curriculum and career guidance. In this study, the researchers present how non-student leaders learn through group development processes and the production of outcomes aligned with the Commission on Higher Education and evolving job markets.

Interaction among college students especially in group work offers many advantages as it contributes to a better learning experience. Teamwork can be an effective way of learning through team cooperation and encourages team members to participate in the process. Teambased learning (TBL) is identified by educators across a variety of disciplines as an effective pedagogical strategy (Leithwood, 2021). Marasi (2019) mentioned that group work helps students gain a better understanding of teams and the team development process as well as develop students' teamwork skills. Interdependence, interpersonal skills, and commitment are key to team effectiveness in working on students' final-year projects (Yusof et al. 2021). Students' reflections indicate that several skills were learned through their semester-long teamwork project, such as communication, collaboration, and friendship development (Van Horne & Rakedzon, 2024). Team-building, placed in an educational setting, takes on an added dimension as a pedagogical framework aimed at fostering group dynamics and familiarizing students with cooperative learning (Georgopoulou, 2024).

Linton et al. (2014) that students in group settings achieved significantly better than those in individual settings. Hammar (2014) also showed that group work facilitated learning in academic knowledge. In addition, those who work in groups gain advanced knowledge in academic knowledge, functioning as individual members, and how they behave and work in groups. This indicates that working in groups learned more compared to when working individually.

The Tuckman model is the most common model that is used to study group development and group dynamics (Kim & Iwuchukwu, 2022). Those who work together, usually follow a social structure to achieve their shared goals, which is considered similar to college students.

In a research article for Small Group Study (Akerlund et al., 2021), Wheelan developed the Integrated Model of Group Development (IMGD) following the concept of Tuckman (1965), Bion, (1961), Bennis and Shepard (1956), and Bales (1965). The IMGD describes how groups go through four distinct stages up to termination stages similar to Tuckman.

The first stage is called Dependence and Inclusion which is similar to the Forming stage of Tuckman. Its salient feature revolves around being dependent on the leader while having reservations about expressing the thoughts and divergent views of the rest of the members. Stage two is termed Counter-Dependence and Fight which is similar to Tuckman's Storming Stage. As the team progresses, members start expressing different views but have difficulty integrating themselves due to personal and task conflicts.

Stage three is named Trust and Structure, parallel to Tuckman's Norming Stage. Here, members realized that they were supposed to blend and become interdependent on one another, as they geared towards focusing on the common goal. Stage 4 is called Work and Productivity similar to Tuckman's Performing Stage. This stage describes how members continue to work on their different roles and work processes where effectiveness, work satisfaction, and cohesion are high. Originally, Bruce Tuckman developed only four stages of Team Development in 1965 but he added a fifth one called Adjourning Stage in 1977. This stage occurs when a group wraps up its work or project and then they eventually part ways. Whellan calls this fifth stage the Work Termination Stage. In this stage, Whellan states that this is an opportunity to look back and learn from experiences.

Marshall Poole's multiple sequence Model (1983) is a descriptive system for studying multiple sequences in a group process. In essence, his discussions are not characterized by phases or blocks but by intertwining tracts of activity and interaction. Eventually, he suggested three activity tracks namely: (1) Task Progress; (2) Relational; and (3) Topical Focus, wherein when the said tracks are interspersed with what he calls "breakpoints," it will create marking changes in the development and links between them. His concept of break points includes: Normal Breakpoint pace with topic shifts and adjournments; Delays as another breakpoint are holding patterns of recycling through information and Disruptions break which is a point were discussion threads with conflict or task failure.

Despite the advantages and learnings achieved in group work, it also presents challenges among students. Hammar (2014), mentioned that group work is perceived as ineffective due to loss of focus and the presence of conflicts, which works against learning. Apparently, group climate and group processes might be the source of negative conceptions of the group and hamper learning. Another study (Wilson et al., 2018) stated that students and instructors experience a common problem when involved in group work and one of the most commonly reported problem is uneven workload (free- riding or overbearing students), social loafing, and time consuming activities to group work (Chang & Brickman, 2018). Similarly, another study conducted by Benson et al. (2019), mentioned that one aspect which can affect the success and failure of groups is how they were formed.

In relation to this study, many quantitative studies have been conducted on the perception of group work among students, however less research was done to investigate the perception of learners on group work using Tuckman's Model. Hence, this study is done to investigate the perception of learners on group work through Tuckman's model.

## **Background of the Study**

Every school year, the Jose Rizal University conducts curriculum review with the aim to continuously improve the curriculum offering of the university. One of the areas that the university looks at is the student learning experience. Using the result of the student learning survey and student satisfaction survey, the researchers deploy a plan to improve the teaching methodology and pedagogy of the Group Dynamics course to address the student learning experience by enhancing its syllabus.

The university offers a Group Dynamics Course as one of the major courses under the Bachelor of Science in Psychology Curriculum. The curriculum is divided into eight semesters with a total of 7 to 8 course offerings per semester. One semester is equivalent to 18 weeks and the learning modality is hybrid learning. The 18 weeks are divided into 3 terms

which are as follows: Prelim, Midterm, and Final Term. The course offering enhancement includes understanding the Tuckman's Stages of team development by teaching its concept during the Prelim Term.

#### **Research Questions**

This study aims to enhance the learning of the students enrolled through a group setting. The main learning objective of this course is to provide students the opportunity to understand the dynamics of group process and functioning particularly in the Philippine organizational setting in the areas of communication, problem-solving, decision-making, leadership, membership, collaboration, competition, and self-awareness. Using Tuckman's stages of team development, the researchers wanted the student to bring their understanding of the team development stages into experiential learning. Specifically, this study answered the following questions: 1) How do students view and experience group development?

## Methodology

## **Research Design**

This qualitative study is done to explore the perception and experience of group work through Tuckman's model among tertiary student learners. In this study, the researchers used Content analysis to understand the themes and concepts of students' views and perceptions as they go through the five stages. Content analysis is a method of qualitative approach to analyzing texts and textual analysis (McKee, 2003; Mayring, 2014).

#### Sample

This student utilized a purposive sample of 30 participants (9=males, 21=females) out of 158 students who submitted weekly reflections on their experience of Tuckman's model while doing group work. To ensure that the researchers get a fair sample from the three section participants, each section had been randomly picked with 10 participants. The inclusion criteria used to ensure that the participants fit the study are 1) 3rd year student currently enrolled in the group dynamics class; 2) have started and completed the project with the same group; 3) not occupying a leadership position within the group; 4) complete all reflection papers and is willing to participate in the study.

#### Data Gathering

Within this term, the students are grouped randomly and were tasked to blend and brainstorm on a particular project where they can experience the whole process of Tuckman's Team Development.

The professor allowed the students to interact with one another after they were randomly grouped. They were just instructed to choose among themselves a leader who would facilitate the project and a secretary to document the progress of the group project. They were given the freedom to decide what particular project they wanted to work on. They were also given a criterion as follows: (1) it should happen within a 6 to 8-week time frame; (2) No solicitation (3) Everyone should be given a role or a task to play (4) consciously undergo the stages of team development and submit weekly individual reflection as they go through the stages. (5)

Submit a progress report of the project they are working on. All submissions have specific deadlines and are submitted in an online learning management system that is being used by the university.

The reflections submitted by the students were carefully reviewed by the researchers and provided the necessary intervention for groups that were having challenges while undergoing the process of working on the project. Furthermore, the researchers reiterated to the students to be mindful of the experience and that the project is only the means to experience the team development stages. As they progress with their respective project, the researchers observe the dynamics of the individual as well as the group behavior manifesting in each project execution.

## Data Analysis

Qualitative content analysis as used in this study uses inductive analysis. This means that the researchers started by examining the data to identify the topics, issues, and messages that mostly occur and then moves back and forth from identifying specifics in texts to making inferences about what those elements might reveal about the speakers, authors, or audience effects. Thus, inductive qualitative content analysis draws on grounded theory approaches (Glaser & Strauss, 1967; Strauss & Corbin, 1990). In this study, each of the reflection papers of the 30 participants as they go through group development stages were analyzed, coded and themed by 3 researchers. As the codes arose, the researchers had agreed to the themes that most represented the reflection thoughts of the students.

## **Results and Discussion**

This study shows that students who experience group development and team-based learning are transformed and have better learning experience (Leightwood, 2021). As students experience transformation while experiencing the stages of team development, they discover their innate capabilities as well as their ability to blend, compromise, collaborate, and make group decisions. Hammar (2014) also showed that group work facilitated learning in academic knowledge. Moreover, the student's individual as well as group experiences created a behavioral and conceptual pattern for each stage leading to accumulating new experiences. Each stage manifested a definition of their cumulative experience which continuously developed up to the last stage creating a whole discovery of the essence of the Tuckman Model translating the concept to practical knowledge and skill.

Stages	Definition	Experiences	Impact
Forming	Familiarization	Bonding	Optimistic
Storming	Conflict	Compromise	Closer Relationship
Norming	Clarity	Comfortability	Stronger sense of optimism
Performing	Collaboration	Productivity	Forming bonds
Adjourning	Collective Success	Transformative	Establishment of connections

 Table 1: Summary of Analyses

Table 1 above shows the metamorphosis of the students' experience as they consciously traverse each stage while doing their group project. The three main concepts were derived from analyzing their reflections using content analysis.

Team development is the core objective of the Group Dynamics Course. After extensively discussing the concept of Tuckman's team development, students were randomly grouped with 5-6 members. The group was given a chance to choose a particular project that they could work on given a 6–8-week time frame. During the Forming stage, the majority of the group achieved familiarization that led to them creating a bond among themselves. This created an optimistic atmosphere in the group (Georgopoulou, 2024).

It was evident during the Storming stage the struggle each member of the group experienced brought about by personal differences, biases, and conflicts of ideas and interests. Tuckman also believes that teams often experience conflict that must be overcome to successfully advance through various stages of team development (Tuckman, 1965). It was in this stage that students learned to compromise which resulted in forming closer relationships among the group members. Marasi (2019) mentioned that group work helps students gain a better understanding of teams and the team development process as well as the development of their teamwork skills.

As the deadline of the project approached, the group continued to meet and discuss strategies and approaches to execute their projects successfully. This exercise brought clarity on the roles each member will play which eventually led them to be comfortable working together. The excitement is evident in their narratives as they experience the Norming stage. A stronger sense of optimism manifested.

Interestingly, there was an overlap of experiences during the Norming and Performing stages. The planning, preparation, and execution continue to shape each group member's attitude and behavior which led them to collaborate and to become productive. Similarly, Klang and Luria (2021) states that those teams who form close relational bonds are more likely to experience higher levels of team effectiveness. In the process, they realize that this joint effort is leading them to bond even closer. Students' reflections indicate that several skills were learned through their semester-long teamwork project, such as communication, collaboration, and friendship development (Van Horne & Rakedzon, 2024).

The adjourning stage generally created an atmosphere of excitement and realization. Most of the projects were executed as expected with some adjustments on logistics and other minor concerns which they readily overcame due to the formed group's resilience. Collective success was the general theme formed during this stage. Moreover, their individual experiences were described to be transformational since they made a lot of self-discoveries about their capabilities. The unique Filipino culture eventually manifested. Instead of them parting ways because the project was over, they did the opposite. They established connections that paved the way for closer relationships.



Figure 1: Conceptual Framework

Figure 1 above shows the conceptual framework of the result of this study. Interestingly, the occurrences of experiences in various stages somehow linger and are carried over into the next stage/s. Those experiences led the students to discover their individual capabilities, led them to be more confident, and motivated them to engage and commit to the success of their projects. Similarly, their view about the concept of teamwork deepens. It made them appreciate individual differences and learn to be cooperative and collaborative. This coincides with the study of Marasi (2019) which points out that group work helped students gain a better understanding of teams and the team development process and teamwork skills (Marasi, 2019).



Figure 2: Group Development Model

## **Group Development Journey**

This group development model depicts the collective experience of the participants as they underwent the group development journey. In this journey, they discovered their individual traits and capabilities. Furthermore, positive and negative social skills, interpersonal (Yusof et al., 2021), and intra-personal continued over time—depending on the development of the group's relationship. Lastly, combining traits, capabilities and having a shared goal (Kim & Iwuchukwu, 2022) led them together to form team relationships that they were able to sustain even after the project was done.

Team building, placed in an educational setting, takes on an added dimension as a pedagogical framework aimed at fostering group dynamics and familiarizing students with

cooperative learning (Georgopoulou, 2024). Similarly, Yusof et al. (2021) posited that Interdependence, interpersonal skills, and commitment are key to team effectiveness in working on a student's final-year project. Furthermore, students' reflections indicate that several skills were learned through their semester-long teamwork project, such as communication, collaboration, and friendship development (Van Horne & Rakedzon, 2024).

It was observed that the group experiences between stages had an overlap of understanding and practice that went deep and wide. It can be gleaned that Filipinos by nature and according to their culture are collectivistic. In the book entitled Step Back Leadership by Lloyd Luna (2019), it was mentioned there that it is innate among Filipinos, particularly the Ifugao tribe have a deep sense of community and what it means for each member (p. 40). Furthermore, Filipinos have the ability to self-organize themselves during the pre-colonial times (Ibid, p. 74).

The Tuckman's concept of team development somehow awakens the sense of community among and between group members and in the process, they rediscover the beauty of working in unity and harmony. This study unearthed the innate qualities of Filipinos that are engraved not only in our culture but in the individual being. The concept of "Bayanihan" translated as "cooperative endeavor" naturally came about while working with teams. Another Filipino term "pakikisangkot" (involvement) and "pakikiisa" (solidarity) spontaneously manifested while working together. Finally, "malasakit" (showing concern) sealed the overall experience as it manifested during the adjourning stage and beyond.

## Limitation

The limitation of this study is that the respondents all under one program which is Bachelor of Science in Psychology, particularly third-year students only. The respondents of the study are participating in a group dynamics project, but they may also be doing group activities in other courses where they interact beyond the researchers control.

This study is homogenous to students who are in non-leadership positions, so the views are separated from those in leadership roles. The students worked on their projects within a definite time frame so this might have given them some pressure and affected their responses. The students as a group were asked to choose their projects which influenced their motivation upon doing the project.

## Conclusion

As the students underwent working in groups as a pedagogical strategy, they created various positive and better learning experiences which can be adapted to different school activities and settings. Although it was observed that the group experiences between stages had an overlap of understanding and practice that went deep and wide, it can be gleaned that team development somehow awakens the sense of community among and between group members while in the process of working together.

Considering the results of this study, further research exploration should be about experiential learning by groups or teams and how they may be adopted as part of learning methodology in college especially in higher years (junior and senior level) across all programs/degrees. Students being given an avenue to sustain the experiences of skills and knowledge discovered (i.e. group research or capstone projects).
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# Mentoring in the Design and Facilitation of Workshops to Promote Professional Well-being in Child Care and Protection Workers

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#### Abstract

The study examines a training program designed to equip coordinators and managers of childcare and protection services in central-northern Italy with the skills needed to design and deliver workshops aimed at improving the quality of working life (Stamm, 1999; Figley, 1993). Conducted from January to September 2022, this program was part of a broader training and research initiative rooted in a critical-emancipatory paradigm (CEP) (Denzin & Lincoln, 2023). The initiative aimed to empower service coordinators to independently design and facilitate workshops-adaptable in terms of group size, methodology, and scheduling-while receiving support from university researchers through a mentoring pathway. The data collected show: 1) a preference for more emotionally neutral topics (selfevaluation and self-care strategies); 2) some difficulties expressed by the coordinators in taking on this task and their request for an external facilitator; 3) both desires and difficulties expressed by the operators in dealing with their own emotions. The purpose of this paper is not to explain these perspectives but to explore and reflect upon them. In addition to theoretical insights from the literature on optimal training design, it is crucial for educators and trainers to understand what constitutes an effective training path for professionals working with vulnerable families. By giving participants a voice, the program enabled them to recognize their role as co-designers of the training process itself-a critical step in fostering their agency and ownership of the initiative (Giroux, 2020).

Keywords: Social Work, Wellbeing, Mentoring Path

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#### Introduction

According to the literature, emotional labour, vicarious disorders, bias in communication processes and resilience are common issues which are central to the wellbeing of those operators who face challenging events and situations on a daily basis in relation to their work commitments. First of all, it is known that social workers have to deal with emotional labour, since any professional who carries out a helping activity more or less consciously or intentionally expresses emotional labour, which can be defined as the set of gestures, actions, choices, reflections and words that are useful to manage or express one's own emotions and those of others in a way that is appropriate to the expectations inherent in one's role (Hochschild, 2012). Depending on their role, workers knows that there is a set of more or less explicit rules that oblige them to express or control certain emotions, both towards the people they are trying to help and towards their colleagues or superiors. They also are required to learn, over time, to control or manage the emotions arising from observing and meeting particularly traumatic or painful situations and that, as such, are capable of jeopardizing their well-being as persons, even before their well-being as professionals (Brotheridge & Grandey, 2002).

In addition, some studies have highlighted that knowing and observing existential situations and vicissitudes of discomfort, material, cultural or symbolic poverty (McLaren, 2015), listening to stories of abuse, mistreatment or parental neglect of vulnerable children, can expose many of the actors who work daily in child and family protection services to the development of one or more emotional, psychological, behavioral and identity disorders: first compassion fatigue, followed by vicarious trauma, both of which are prerequisites for burnout (Figley, 1989; Stamm, 1999; Maslach & Leither, 2016). In addition to this triggering factor, many social workers are confronted daily with an overload of work and often unacknowledged responsibilities, to which are added the annoyance of bureaucratic procedures and a public opinion ready to attack and penalize any of their gestures or actions (Anderson, 2000). All these elements put a strain on the professional and identity balance of these workers, sometimes leading them to exhaust all the energy (cognitive, emotional and physical) they can devote to a job from which they may wish to withdraw, even though they have chosen and loved it from the beginning of their professional career (Figley, 1989).

Sometimes the fatigue perceived and experienced by social workers also stems from some difficulties they face in the communication processes, both with colleagues and with the people they are trying to help. Our mind has, indeed, evolved over the millennia by developing a series of strategies that enable each of us to deal with the complexity of reality by means of quick and efficient interpretative schemata. These mental schemata enable us to make decisions and act even under conditions of partial or great uncertainty. This usually occurs when there is not enough time to weigh up all the information, when there is not enough information to make an objective assessment of the facts, or even when one is in a position of responsibility for others and in a moment of great physical and mental exhaustion. In such situations, which are so common in helping work, these strategies are used spontaneously and unconsciously, so that they sometimes are likely to risk to become real pitfalls, impairing communication and leading us to make errors of judgement: for example, when we are guided by our prejudices or stereotypes, or when we rely too much on our own strengths without actually having sufficient resources (Haselton et al., 2009; Hertel & Mathews, 2011).

Another significant theme in social work revolves around the construct of resilience. While resilience is narrowly understood as the ability of people in situations of vulnerability to adopt a path of positive adaptation and overcome the adverse situation in which they find themselves, we underline that often the structural and environmental causes of inequality are not adequately addressed (Hart et al., 2016; Ius, 2020). This perspective often casts social workers as "guardians of resilience," positioning them as facilitators of others resilience rather than professionals who approach challenges from a systemic perspective while demonstrating their own resilient responses to the difficulties they encounter daily (Ungar, 2021).

# The Research-Training Path

The aim of this paper is to present the results of a mentoring pathway carried out to support a group of 27 service coordinators and managers employed in child care and protection services working with families living in a vulnerable situation, within 3 local authorities / services in Region Emilia-Romagna, a region of central-northern Italy. These coordinators were involved in a training and research programme, designed and coordinated at the University of Padua (Bobbo et al., 2024). The training aimed at disseminating knowledge about vicarious disorders and skills related to self-care strategies, and was designed in order to enable them to take responsibility for promoting the professional wellbeing of the teams they coordinate, by activating and strengthening some self-care strategies and promoting mutual supportive working communities (Stamm, 1999; Figley, 1995). The training program, which lasted from January to May 2022, included three types of actions: thematic webinars to provide theoretical and practical knowledge on specific topics; the resource Book to have a guide containing theories, self-assessment tools, and activities to support the creation of tailored workshops; reflective mentoring to offer ongoing support and feedback.

The first action proposed thematic webinars on aspects related to professional well-being shown above. Each webinar, beyond the theoretical part, included the presentation and use of some workshop strategies useful to support practitioners in dealing with the results of emotional labor, preventing vicarious disorders, becoming aware of their own cognitive biases and how they play out in communication processes, and becoming resilient professionals. The strategies were proposed and experienced with the coordinators to enable them to use those strategies in the implementation of wellbeing promotion workshops to be carried out with their operators within their respective services. These strategies are conceived in four levels of insight into personal perceptions and experiences regarding one's own professional well-being and discomfort. The four levels are:

- 1. Self-assessment: it included tools useful to assess personal wellbeing, assess personal and team fatigue signs, encourage self-reflection on the daily time sheet (balance between lifetime and work time).
- 2. Emotional labor and professional identity: it included tools useful to increase intraand interpersonal emotional awareness.
- 3. Cognitive bias: it included tools useful to identify personal cognitive biases and overcome them by becoming more aware of this kind of pitfall.
- 4. Self-care strategies and reciprocal supporting community: it included tools useful to identify personal self-care strategies and make operators build mutual support communities in their services.

Lastly, since the training path took place at a time when the pandemic was still ongoing in Italy, so that most of the meetings and the training course had to be conducted online, it

seemed necessary to support the coordinators in the use of this type of tools as a prerequisite for the implementation of the wellbeing activities with their operators. So, the path included some webinars focused on the use of videoconferencing platforms in training, facilitation of online meetings, use of online tools to support training and make it more interactive.

The second consists in the support provided by a published book containing the main theories to present the ideas underpinning the programme, and different activities that are described and explained as a "set of bricks" each coordinator could consider and use to creatively build up their own paths addressed to their teams (Bobbo & Ius, 2021). In fact, at the end of the training process, the coordinators were invited by design and facilitate workshops tailored to their team's needs. Flexibility in group size, methodology, and scheduling were key aspects to consider in the implementing phase.

The third action regards the reflective mentoring. During the implementation of the local workshops, which lasted from June to November 2022, the researchers proposed to the coordinators a continuous mentorship to provide them with guidance and support through a series of reflective mentoring sessions. This action aimed to accompany their work, both in the planning and in the realization of the workshops they had chosen to facilitate. Some of these online meetings were scheduled on a monthly basis, while others were organized at the request of participants who needed support to define and implement their projects. These meetings were thus held with different working groups and allowed each coordinator to gain mutual discussion on ongoing projects and difficulties. A final meeting was held to collect some feedback from the groups that had completed their local projects and to discuss the different experiences.

# A Research Project on the Mentoring Path

# The Critical Framework

The research paradigm chosen for the training-research path was critical-emancipatory (Denzin & Lincoln, 2023). This paradigm conceives of research as a tool for the emancipation of oppressed people, so the research-training path was developed viewing participants as co-researchers and co-designers in their learning journey to address professional oppression and stress.

The word oppression evokes any situation in which people feel powerless and overwhelmed by life or professional events. Based on the evidence that social workers working with vulnerable families and children are often overwhelmed by stress, compassion fatigue and burnout caused by the complexity and drama of the situation they are dealing with (Bobbo et al., 2024), we considered social workers and their coordinators as "oppressed" people. The conduction of the mentoring path was considered under the same logic of emancipation. Beside this, the pedagogical framework underpinning this path underlines firstly the intention to promote processes of self-reflective and meaningful learning among professionals about their capacity for self-protection and resilience (Calaprice, 2020; Cyrulnik, 2001); secondly, the need to choose a training/research approach that would meet the following conditions: the immediate usefulness of the knowledge that these activities could promote; a fully active role of the actors involved; the consensual production and legitimation of knowledge; lastly, the goal to make the pathway a real opportunity for learning and empowerment for all the actors involved, both operators and researchers (Formenti, 1998).

#### A Glance on the Perspective of Coordinators

The mentoring pathway was designed to support the coordinators to independently design, implement and manage workshops (adaptable in terms of group size, methodology and scheduling). During the tutoring path, researchers collected their words and thoughts, firstly with the aim to give them voice and acknowledging their professional experience, and secondly to achieve a better comprehension of their perspective on the path.

Understanding their perspective was useful to assess how they comprehend the theoretical and methodological proposals presented during the webinars. During each meeting, the coordinators had the opportunity to express their difficulties, the obstacles they encountered and, by sharing them with the researchers, they were able to find some solutions or simply conceive a different way to face the project or the realisation of the activities. This happened because they shared their difficulties and doubts not only with the researchers but also with their colleagues, on a community level. Often, in these sessions, the discussion flew with only a few actions of the researchers, who acted as facilitators of a group of the participants who were able to co-construct the methodological knowledge they needed to move forward. Moreover, they had the opportunity to share about their work, their fatigue, the difficult conditions of their services, and this allowed them to shaping to their thoughts, making them clearer even to themselves (Giroux, 2005, p. 205).

In this logic, this paper aims at presenting the participants' perspectives rather than to explain them, because we think the coordinators' perspective is useful to understand the strengths and weaknesses of both the training project we carried out and the different workshop the coordinators realised, in a kind of formative assessment for both agents of the project (Gasmalla et al., 2023).

#### **Results and Discussion**

Despite the structured framework, coordinators largely opted for simpler tools and less demanding workshop designs, prioritizing short-term gains over in-depth exploration of professional well-being. Briefly, the data collected show: 1) coordinators' preference for more emotionally neutral topics (self-evaluation and self-care strategies); 2) some difficulties expressed by the coordinators in taking on this task and their requests for an external facilitator; 3) both desires and difficulties expressed by the operators in dealing with their own emotions.

Regarding the first point, coordinators were offered a choice between different models of lab paths and tools. However, they predominantly opted for simpler tools to design short workshops, which encouraged only superficial reflection on their well-being. The proposed journey included four different, progressively complex types of labs: self-assessment, emotional labour, cognitive bias, and self-care strategies. Although the ultimate aim was to build mutually supportive working communities, most coordinators chose to stop at the first step. The most popular workshop was the self-assessment lab, selected by 22 coordinators. The emotional labour lab and resilience lab were chosen by 4 coordinators each, while the cognitive bias lab was selected by only 1 coordinator.

Midway through the path, the mentoring activity invited coordinators to describe and reflect on their experiences, consider what could have been improved, and identify what they felt was missing. The positive aspects coordinators underlined were a good level of participation in an initiative that was perceived as legitimate. They appreciated the strong team spirit and sense of cooperation that emerged. They also struggled in finding time and space for other work commitments and in sharing emotional memories and feelings with colleagues.

In response, they requested for more support from the mentors, more opportunities to share lab content online with other services, more chances to meet and chat with other coordinators, and lastly, but more significantly, they asked for the possibility of involving an external facilitator to manage the private and emotional dimensions of the dialogue.

At the conclusion of the path, we presented the coordinators with four evocative keywords to guide their reflections on the journey: Positive Feelings, Team Atmosphere, Criticism, and Facilitator Tasks.

Regarding the positive feelings lived during and at the end of the path, coordinators reported discovering new protective factors within their group, expressing a desire to connect with one another and discuss emotions. Some also expressed pride in their team.

The team atmospheres they described were characterized by openness, honesty, availability and spontaneity.

The criticism they pointed out as areas for improvement regards initial challenges in understanding and using some tools; inadequate spaces for conducting workshops; discontinuity and instability during the process; fatigue and the emergence of destabilizing emotions within the group.

Regarding the facilitator role, most of them state that it was particular demanding. Many noted the challenge of navigating the dual role of being both a service coordinator (responsible for organizational tasks) and a group facilitator (focused on promoting team well-being). They emphasized the difficulty of overcoming resistance within the group and often felt lonely in balancing the desire to solve problems with the need to facilitate effectively. By the end of the path, it became evident that coordinators faced significant obstacles in finding time and space for these activities and in openly sharing personal difficulties or vulnerabilities. This was often tied to the need to uphold the image of the "strong social worker." The ambiguity of the dual role—being both a service coordinator responsible for HR and a group facilitator promoting well-being—was a recurring theme. This ambiguity likely contributed to their frequent requests for help, whether from researchers or independent supervisors.

This initiative uncovered significant barriers to implementing professional well-being strategies, such as organizational constraints and cultural resistance to vulnerability. While participants valued the mentorship and support provided, they often sought additional guidance, creating challenges for researchers in balancing the need to foster autonomy with the necessity of offering adequate support.

These findings emphasize the need for researchers and service managers to:

 Reframe the role of coordinators as facilitators of team well-being rather than mere HR managers, by implementing programs for the prevention and monitoring of wellbeing within the organization (Figley 1989; Slatten et al., 2020).  Strengthen reflective practices as a means to achieve autonomy in addressing professional challenging experiences (Harrington & Loffredo, 2010) by creating more accessible tools for professional development and wellbeing.

Nevertheless, these improvements cannot be fully realized without a systemic change in the policies of social work services, prioritizing the emotional well-being of operators over the need to optimize service costs.

#### Conclusions

This path highlights the challenges faced by researchers and trainers in understanding the needs of coordinators, amplifying their voices, and enabling them to become autonomous in creating and maintaining the conditions necessary for the well-being of the professionals they coordinate. The mentoring path and the voices we collected confirmed the need to continue using a critical participatory approach in research and training in order to model coordinators as co-designers: the difficulties they have encountered along the way make them ask for help, but at many of them would receive that help passively, whereas others asked for help only to go forward. Some coordinators felt that they had too many work commitments to take on other responsibilities and were threatened by the emotions that workshops let emerge, but at the same time other coordinators, facing these same difficulties, wanted to go on in improving the wellbeing of their operators and perhaps also in order to gain an agency that they often don't have in the public services. One of the key objectives of the mentoring pathway was to support coordinators in managing the dual role we asked to play. It aimed to help them move beyond a reliance on external assistance and instead become active agents of change. This outcome could not have been achieved without providing coordinators with a platform to voice their experiences, as we did. By giving them a voice, we helped them recognize their opportunities and resources, fostering a deeper awareness of their potential as co-designers of transformation (Giroux, 2004).

The training path highlighted the complexities of promoting professional well-being in childcare and protection services. While the critical-emancipatory approach proved effective in engaging participants and fostering meaningful learning, it also revealed significant limitations in current organizational practices. Future efforts should prioritize participatory and reflective methodologies, ensuring that coordinators are adequately supported and empowered to lead sustainable well-being initiatives within their teams.

#### Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work the authors used Chat GPT in order to check linguistic translation. After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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# A Barthesian Analysis of Semiotic Practices in an Indigenous School in Taiwan – A Case of a Bunun Elementary School

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#### Abstract

This study explores the role of totems and decorative texts in shaping cultural identity among Indigenous students at an elementary school in Taiwan. By employing Roland Barthes' semiotic theory, this research aims to uncover the cultural meanings and social functions of visual symbols, focusing on the Bunun woodcarving calendar, diamond totems, the phrase '禮 義廉恥' (Li, Yi, Lian, Chi), and symbols of multiculturalism. The study utilizes qualitative methods, combining observations, interviews, and document analysis to explore how these symbols perform as carriers of hidden meaning and contribute to educational and cultural settings. The representative semiotics were selected based on their frequent appearance across the campus and their cultural relevance to the students. Observations were conducted over six months, with interviews involving students, teachers, and school administrators. The findings reveal that semiotics play a crucial role in connecting Bunun students to their school environment and enhancing their cultural identity. However, the study also highlights the challenges these students face in navigating the cultural conflicts between their indigenous heritage and the dominant mainstream culture. This study underscores the importance of integrating minority cultures into education and addressing the tension between cultural identity and mainstream practices in Taiwan.

Keywords: Roland Barthes, Semiotic, Cultural Identity

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# Introduction

In contemporary society, schools are vital spaces not only for knowledge transmission but also for identity construction (Flum & Kaplan, 2012). This is particularly crucial in Indigenous education, where teaching practices nurture identity and cultural confidence. In Taiwan, Indigenous education addresses educational equity, cultural preservation, and social diversity (Nesterova, 2019a). Since the Dutch invasion in 1624, Taiwan's Indigenous peoples have faced colonization and oppression, leading to challenges in cultural, social, and educational rights (Van Bekhoven, 2016; Yi-Shiuan Chen et al., 2018). Despite policies like the Indigenous Education Act (1998), which emphasizes teaching Indigenous knowledge, and secured admission regulations for Indigenous students (Ministry of Education, relegating cultural content as supplemental (Nesterova, 2019b). Research suggests curricula have not fully achieved goals, calling for greater integration of Indigenous history and values (Chen, 2012).

To explore how educational practices promote identity and cultural confidence, this study examines the symbolic practices at a Bunun Indigenous elementary school in Nantou County. Using Roland Barthes' semiotic theory, it analyzes cultural meanings and social implications of school symbols, focusing on their influence on Bunun students' cultural identity.

Barthes' semiotic theory provides a suitable framework as it emphasizes the cultural significance of symbols and their social contexts (Barthes & Lavers, 1993). Unlike earlier Western positivist frameworks that often disconnected Indigenous knowledge from culture (Ali et al., 2022), Barthes' approach delves beyond literal meanings, uncovering deeper connotations. Indigenous cultures are rich in symbolic stories passed down through generations (Cameron, 2015). This study seeks to contribute to more inclusive and culturally sensitive educational policies by revealing the role of symbols in Indigenous identity formation and education.

# Literature Review

This chapter is going to review the relevant research on Taiwan's Indigenous education and semiotics employed within educational and cultural research. Additionally, since this research discusses school symbols within educational settings, the researcher will explore concepts related to campus symbolic space, aiming to discuss how symbolic spaces influence students' behavior and identity and to construct an educational space that positively acknowledges culture. Lastly, this study explores the traditional culture and society of Taiwan's Bunun people.

#### 1. Semiotics and Indigenous Education

Semiotic theory has been widely applied in education, offering insights into how meaning is constructed through curriculum design, teaching processes, and educational content. Saussure defined semiotics as the study of 'the life of signs' in society, while Pikkarainen (2011) and Olteanu (2014) highlighted its role in understanding learning, communication, and teacher-student relationships. Classrooms are thus seen as semiotic spaces where signs—from textbooks to gestures—shape knowledge and meaning.

Barthes' concept of 'mythologies' reveals hidden ideologies in cultural phenomena, influencing curriculum analysis. Studies like those by Bourdieu (1990) and Bullivant (1983) applied Barthes' theories to explore how curricula perpetuate power structures and social inequalities. Visual analysis of educational materials, as emphasized by Aiello (2006), further uncovers how visual elements shape student perceptions.

In Indigenous education, cultural symbols are central to identity and confidence (Hapeta et al., 2019). Incorporating Indigenous totems, songs, and stories into school curricula enhances students' understanding of their culture. Semiotic theory helps analyze these symbols' educational significance and their role in shaping cultural identity.

Although semiotics is not yet prevalent in Taiwanese Indigenous education research, Lin (2022) emphasized the richness of traditional symbols as learning materials. By focusing on Indigenous cultural characteristics, semiotics offers a way to connect cultural values with educational materials, fostering a culturally responsive teaching environment that bridges mainstream values and Indigenous identities.

# 2. Indigenous Education and Cultural Identity

Education in Indigenous communities serves as a tool for cultural identity preservation, but it often fails to meet their specific needs. Policies shaped by colonial mindsets, as Said (1978) noted, marginalize Indigenous peoples and suppress autonomy. In Taiwan, public school teachers unconsciously transmit mainstream values through uncritical curricular practices (Hsu, 2017). To address these issues, Indigenous curricula must reflect their unique cultural characteristics and encourage educators to adopt critical and reflective approaches.

Indigenous education is deeply tied to collectivist kinship systems, emphasizing communal participation over individualism (Yeo, 2003). Learning occurs naturally within families and communities, where children acquire essential skills by observing and interacting with tribal members (Turner-Jensen, 2019). This dynamic process, rooted in traditions and values, integrates education into daily life and strengthens cultural identity (Samson & Gigoux, 2016).

Cultural identity is vital for Indigenous students' development, especially in a globalized world. A strong cultural identity correlates with improved academic and social performance (Fryberg et al., 2013). Integrating Indigenous cultural elements into curricula fosters students' self-identity while balancing mainstream values, enhancing confidence and motivation (Lowe et al., 2021; Reedy, 2019).

Barthes' semiotic theory provides a framework for understanding cultural identity through signs, which carry both denotative and connotative meanings. In educational practices, cultural symbols help students internalize their heritage. For example, Bunun totems embody myths and values, allowing Bunun students to deepen their cultural understanding and solidify their sense of belonging.

# 3. Indigenous Education in Taiwan

Taiwan is a multicultural nation with Han Chinese (over 95% of the population) and 16 recognized Indigenous groups comprising 2.5% (Ministry of the Interior of Taiwan, 2024). Indigenous peoples, part of the Austronesian language family, have distinct cultural and

linguistic traits, having lived in Taiwan for thousands of years before colonial powers arrived (Huang & Liu, 2016).

During colonial rule (1624–1945) and Nationalist governance (1949–1987), assimilation policies marginalized Indigenous cultures and identities through forced relocations and education systems promoting Han Chinese values (Nesterova & Jackson, 2018). While democratization in the 1990s introduced multicultural reforms to address these inequalities, challenges persist. Biases among predominantly Han Chinese teachers, resource shortages, and curricula favoring Chinese values over Indigenous heritage hinder the progress of Indigenous education (Nesterova, 2019b).

Standardized curricula and testing, based on Han Chinese norms, fail to reflect Indigenous knowledge and values (Fenelon & LeBeau, 2006; Ho, 2021). In response, some Indigenous communities have established educational spaces rooted in their languages, mythology, and traditions, aiming to revive cultural practices and foster culturally relevant learning environments (Ho, 2022). These efforts highlight the diversity within Indigenous approaches to education, shaped by distinct historical and social contexts.

# 4. Bunun Traditional Culture

In the Bunun language, "Bunun" means "people," a term reflecting their self-identity and emphasizing tribal exclusivity (Huang, 2006a; Tien, 1992). Residing in Taiwan's Central Mountain Range, the Bunun faced constant challenges, shaping their resilient and non-submissive character. They resisted assimilation and were among the last to yield to Japanese rule during the occupation (Tien, 2002).

The Bunun's lifestyle, rooted in hunting and shifting cultivation, reflects their reverence for nature and strong community values. Their cultural practices, including rituals, music, and dance, express their bold, cheerful spirit and artistic identity (Tien, 2019). Social status in Bunun society depends on contributions to the tribe, fostering mutual support, cooperation, and a collective consciousness evident in practices like sharing harvests and work exchange (Chen, 2005; Huang, 2006b; Tien, 2002).

Bunun religious beliefs center on reverence for "Heaven" and ancestral spirits (hanitu), which guide moral order and daily behavior (Huang, 2006b; Tien, 2002). While some traditional rituals have declined, significant ceremonies like the Ear Shooting Festival continue to embody cultural and educational values.

The Bunun's collective consciousness, respect for nature, and cultural practices sustain their identity and provide a foundation for preserving their traditions in modern society.

#### Theoretical Framework

This study examines the significance of campus symbols from a semiotic perspective and their impact on Taiwan's Indigenous education and students' cultural identity, drawing from semiotic theory.

Semiotics, as defined by Saussure (2011), studies signs and their role in society. A sign consists of a 'signifier' (form) and a 'signified' (concept), with their relationship established through social conventions.



Figure 1: Saussure's Signs in Semiotics Resource: Drawn by the researchers; quote from de Saussure et al. (2011)

Saussure (2011) also distinguished between synchronic (present context) and diachronic (historical evolution) aspects of signs. Barthes (1993) expanded on Saussure's ideas, introducing myth as a cultural system of communication, where signs function on multiple levels. Barthes emphasized two layers of meaning: denotation (explicit meaning) and connotation (cultural and ideological meaning). Consequently, Barthes constructed an intersecting relationship between language and myth within his semiotic theory, as follows:



Figure 2: Roland Barthes' Semiotic Theory Resource: Barthes (1993)

Barthes' semiotics critiques social and cultural ideologies, uncovering how myths serve class domination by transforming history into nature. His approach reveals hidden cultural meanings in symbols, making it particularly relevant for analyzing Taiwan's Indigenous education system.

# **Research Method**

This study adopts a qualitative research design to explore symbolic practices within Bunun Elementary School A in Taiwan and their impact on Indigenous students' identity formation. By observing and analyzing totems, texts, and decorations on campus, the research uncovers their cultural significance and meanings.

Bunun Elementary School A is located in central Taiwan, deep in the mountains, and closely connected to the Bunun tribe. The school has 53 students and 14 faculty members, most of whom are Indigenous. Its remote location limits cultural assimilation with Han Taiwanese culture.

Data collection methods include observations, interviews with students and teachers, and analysis of relevant materials. Four key campus symbols were selected for study: the Bunun woodcarving calendar, diamond totems, the phrase "禮義廉恥," and multicultural celebration signs. Observations noted the prominent display of these symbols across the campus environment.

For analysis, Roland Barthes' semiotic approach is used to decode the visual messages of campus symbols and their connotations. Semiotic analysis reveals the cultural and ideological meanings embedded in these symbols, viewing them as carriers of myth. Barthes' framework helps uncover the second-order meanings of these signs, linking them to socio-cultural

contexts and Indigenous perspectives. The two order of signification by Roland Barthes as the following diagram,



Figure 3: Roland Barthes's Two Order of Signification Resource: Drawn by the researchers; quote from Roland Barthes (1993)

This research aims to provide a comprehensive understanding of the symbolic practices in Indigenous schools and their role in shaping students' cultural identity.

# The Meanings of Symbols in the Bunun Elementary School A Campus

This chapter conducts a Barthesian analysis of the meanings of the symbols and signage present in the Bunun Elementary School A campus, which is the focus of this study. The researcher selected and analyzed four physical symbols and signs that repeatedly appear in various locations on the campus and have close interactions with students, including totems, texts, and decorative items.

# 1. The Bunun Woodcarving Calendar

As one enters the campus, the traditional Bunun woodcarving calendar is prominently embedded on the wall beside the school entrance, painted in bright yellow on stones. When approaching the staff office, the woodcarving calendar reappears on a nearby stone wall. Figures 4 and 5 below show the locations where the traditional Bunun woodcarving calendar appears on the campus.



Figure 4: Campus Wall Resource: Taken by the researchers



Figure 5: Stone Wall Outside the Office Resource: Taken by the researchers

In terms of denotation, the woodcarving calendar features a horizontal baseline with continuous diamond shapes marking days. Symbols like square and circular points denote key agricultural dates, hunting results, and festivals, such as planting millet, harvesting, or hunting. In ethnic classes, terms like malaqtainga (ear festival), minpinang (sowing festival), qanup (hunting), and maduq (millet) are taught to represent significant Bunun activities and rituals. Malaqtainga in April or May involves rituals for hunting abundance and annual tribal affirmations. Minpinang, held in November or December, prays for millet harvests, with men singing the Song of Prayer for Millet Harvest. Qanup reflects communal hunting traditions, with shared spoils. Maduq, a staple food alongside sweet potatoes and corn, is vital for both sustenance and trade in Bunun livelihoods.

In terms of connotation, the woodcarving calendar reflects the Bunun people's concept of time and social structure. The traditional Bunun notion of time emphasizes temporality and human activities rather than an abstract concept of time that references precise locations or calculations (Huang, 2006b). Additionally, this temporality represents the order and status within traditional Bunun society, indicating that members of the same community must adhere to a shared timeline and fulfill their obligations.

From a diachronic perspective, the calendar evolved from a practical timekeeping tool to a symbol of cultural heritage and revival. Under colonial rule and Han cultural influence, its role shifted, aligning with Barthes' idea of myth as a neutral tool transformed into an ideological symbol. During the 1990s, as part of Taiwan's localization movement and the Indigenous cultural revival, the woodcarving calendar was re-endowed with significance, transforming into an emblem of Bunun cultural revival. In modern educational contexts, its presence is a signifier of cultural continuity and a marker of the Bunun people's broader efforts to reclaim their traditions.

From a synchronic perspective, the Bunun woodcarving calendar symbolizes Bunun culture within schools, coexisting with symbols of multiculturalism like bilingual displays. This creates tension between cultural preservation and globalization. As a mythical tool, the calendar signifies time while embodying the struggle for cultural survival and identity. It challenges students to balance cultural pride with the competing values of mainstream society and globalization. According to Barthes, it serves as a mythological signifier, reflecting efforts for cultural revival while highlighting tensions with modern educational goals such as academic success and multicultural inclusion.

#### 2. Bunun Diamond Totem

When walking around the campus, one can clearly see the diamond totems, characterized by continuous diamond shapes, geometric patterns, symmetry, and black-and-white alternation, appearing in various places such as on the columns at the school entrance, the exterior walls of classroom buildings, and decorative boards. The following Figures 6 to 9 show the locations where the diamond totems appear on campus:



Figure 6: Outside of Classrooms



Figure 7: School Gate



Figure 8: Decorative Billboard Resource: Taken by the researchers



Figure 9: School Auditorium Wall Resource: Taken by the researchers

In terms of denotation, the diamond totem usually consists of one or more diamonds, which may include various details and decorations such as dots, lines, and patterns. According to the Bunun oral tradition, the diamond-shaped totem was originally drawn from the head shape of a viper. The diamond totem is commonly seen in traditional Bunun clothing, tools, implements, and ritual items. In both cultural and art classes, the term 'kaviaz' (viper; friend) is used to describe the totem, with teachers and students discussing its roots in ancient Bunun mythology.

The connotation of the diamond totem originates from a Bunun legend where a woman, inspired by a viper's patterns, used them for weaving. This sparked a conflict, resolved when the viper allowed the use of its patterns in exchange for respect and protection from harm (Tien, 1995). The viper's names, gavit (oath) and kaviaz (friend), symbolize reconciliation and coexistence (Rimuy Aki et al., 2021). Beyond its literal meaning, the myth embodies Bunun values like respect for natural law, harmony between deities, nature, and humanity, and core social virtues such as bravery, wisdom, unity, and respect.

From a diachronic perspective, the diamond totem evolved from its mythological roots into a symbol of the Bunun people's respect for nature and cosmic order. Despite colonial disruptions and Han cultural dominance, it remains integral to rituals and daily practices, embodying resistance to cultural erasure. As Barthes' theory highlights, the totem's transformation into a cultural myth perpetuates ideological values, affirming the Bunun's harmonious relationship with nature and ancestral beliefs as enduring and "natural" truths amidst modern cultural challenges.

From a synchronic perspective, the diamond totem in contemporary Bunun schools symbolizes the balance between cultural continuity and globalization. For students, it aids in exploring their Indigenous identity while staying rooted in their heritage. Integrated into activities like painting, weaving, and storytelling, the totem serves as a living emblem of identity and ethical values, reflected in terms like "gavit" (oath) and "kaviaz" (friend). Barthes' semiotics reveals its evolution into a modern cultural myth, bridging the past and present, and helping students reconcile their Indigenous identity with the demands of a globalized world.

# 3. The Characters "禮義廉恥"

Before entering the classroom, the researcher noticed the prominent and clearly visible characters "禮義廉恥" (Propriety, Justice, Integrity, and Shame) made from aluminum sheets on the wall, as shown in Figure 10. Moving further inside the building, the same phrase

appears again, this time made from acrylic panels, securely attached to the wall in the public reading area, as shown in Figure 11.



Figure 10: Office Exterior Wall Resource: Taken by the researchers



Figure 11: The Wall in the Public Reading Area Resource: Taken by the researchers

In terms of denotation, 禮(Lǐ) refers to propriety and etiquette, emphasizes respect for others and adherence to social norms; 義(Yì) signifies righteousness and justice, underscores fairness, honesty, and the defense of rightful interests; 廉(Lián) means integrity and honesty, stresses the importance of trustworthiness and refraining from wrongful gain; and 恥 (Chǐ) denotes shame and disgrace, highlights the need for personal shame after moral failure and the effort to amend one's behavior. Although "禮義廉恥" is not formally part of the official curriculum, teachers often invoke terms like "忠孝" (loyalty and filial piety), "仁愛" (benevolence), "信義" (trust and righteousness), and "和平" (peace) when explaining these values. These terms act as extensions of the core principles, further enriching the ethical landscape that "禮義廉恥" encapsulates.

In terms of connotation, "禮義廉恥" reflects Confucian ideals of personal cultivation and societal harmony, emphasizing self-restraint, self-reflection, and social order. These values were central to maintaining social cohesion and ethical conduct within a structured hierarchy. After the Kuomintang (KMT) relocated to Taiwan in 1949, Confucian ethics were promoted to strengthen national identity and support anti-communist ideals. These values were integrated into education to cultivate loyal citizens aligned with the state's interests. However,

since the 1990s, as Taiwan embraced democracy and cultural diversity, the influence of these traditional values has gradually declined.

From a diachronic perspective, '禮義廉恥' (Propriety, Righteousness, Integrity, and Honor) evolved from Confucian teachings to a tool used by Taiwan's authoritarian government to promote ideological control (Lee, 2017). Adopted as a school motto in 1939, it became a symbol of national identity and anti-communist ideology. Barthes' concept of myth applies here, as the phrase reinforced dominant ideologies. After Taiwan's democratization in 1987 and education reforms in 2001, '禮義廉恥' lost prominence, shifting toward more pluralistic values (Lee, 2017). However, it still influences education, blending traditional Confucian values with modern ethical ideals like responsibility, kindness, and self-discipline.

From a synchronic perspective, while '禮義廉恥' originates from Confucian thought, its presence in Bunun Indigenous schools creates a clash between Confucian and Bunun cultural values. Barthes' theory highlights how symbols like '禮義廉恥' reinforce dominant ideologies while being reinterpreted in new contexts. For Bunun students, the concepts of respect and harmony may align with Confucian ideals, but their deeper meanings—such as loyalty to state authority—conflict with the Bunun emphasis on collective, egalitarian traditions. This symbol becomes a tool for integration, subtly encouraging students to conform to mainstream norms, potentially compromising their cultural identity.

#### 4. Signs Celebrating Cultural Diversity

On staircases and in hallways, the school had placed English words promoting international education, as shown in Figure 12. Since the school's students are all Bunun, the opposite side of the hallway features Bunun language words aimed at enhancing the students' proficiency in their native language, as illustrated in Figure 13. Additionally, introductions to other Indigenous groups were found, as seen in Figure 14.



Figure 12: English Words in the Hallway Resource: Taken by the researchers



Figure 13: Bunun Words in the Hallway Resource: Taken by the researchers



Figure 14: Introduction to Taiwan's 16 Indigenous Ethnic Groups Resource: Taken by the researchers

In terms of denotation, the English slogans display simple everyday phrases, such as "My iPad is dead," "Trick or treat," "Keep in touch," and "My honor," which are familiar expressions in daily life. The Bunun slogans, on the other hand, feature words related to the Bunun language, such as "friend(kaviaz)," "stream(vaqlac)," "hunting(qanup)," and "filial piety(madaidazis)." These are key terms in the everyday life of the Bunun people. In additionally, the school also showcases information about Taiwan's other 15 Indigenous groups, including population statistics, distribution areas, and social systems.

In terms of connotation, in the past, Taiwan's education system heavily emphasized Han culture, which led to the risk of assimilation for Indigenous students and sometimes triggered violence within the school environment, whether related to gender or ethnicity (2018). Nesterova (2019b) points out that Indigenous students' dissatisfaction with the national education system stems from the curriculum and teaching methods lacking cultural sensitivity, marginalizing Indigenous peoples as "the Other." Since the 2014 introduction of 12-year curriculum that includes "Multiculturalism Taiwan's and International Understanding" as part of core competencies, multiculturalism has become a critical issue in education policies. The Bunun school's cultural diversity signs reflect this policy (Ministry of Education of Taiwan, 2021a). These slogans not only acknowledge contemporary education's recognition of multiculturalism but also further promote the implementation of human rights and diversity strategies, ensuring the realization of social justice. Moreover, the Bunun slogans symbolize resistance to the pressures of globalization, reminding students to maintain a connection with their own culture while reinforcing their awareness of their group's history and culture.

From a diachronic perspective, the bilingual slogans reflect the historical blending of Bunun and international cultures. English symbolizes globalization's influence, while the Bunun language embodies historical memory and traditions. Once transmitted orally, the Bunun language faced challenges due to colonialism and Han cultural dominance. Today, its presence in school spaces like corridors and staircases represents language revival and cultural identity affirmation. The coexistence of English and Bunun highlights dialogue between globalization and local culture, showing how students navigate both worlds. Over time, these slogans have evolved from communication tools to symbols of cultural resistance and identity. Within Barthes' framework, they form a cultural myth, embodying the tension between global and local cultures and reinforcing the Bunun language's permanence and the importance of cultural diversity.

From a synchronic perspective, the bilingual slogans reflect the Bunun school's cultural reality and multicultural challenges. Displayed daily, they expose students to both global and Indigenous cultures. English phrases like "My iPad is dead" and "Trick or treat" highlight the influence of Western consumer culture, while Bunun slogans emphasize traditional practices, such as "hunting" and "mountain." This duality familiarizes students with their roots while confronting them with global integration, creating a coexistence of cultural continuity and tension.

These slogans transcend language displays to become mythic symbols of cultural identity. Drawing on Barthes' theory, they evolve into cultural myths, representing Bunun students' negotiation between global and Indigenous identities. While promoting multicultural ideals, the slogans subtly affirm the equal value of Bunun culture in globalization, reinforcing students' cultural identity amidst these challenges.

# The Influence of Campus Symbols on Indigenous Students' Cultural Identity

This study analyzes the significance of signage and symbols on the campus of Bunun Elementary School A in Taiwan using Barthes' semiotic analysis. The study suggests that the analysis of these samples reflects the current situation of ethnic minorities in Taiwan and provides three insights: (1) Cultural symbols connecting Bunun students to school; (2) The struggle for cultural identity in education; (3) The myth of multiculturalism in Indigenous education.

# 1. Cultural Symbols Connecting Bunun Students to School

At Bunun Elementary School A, cultural symbols like totems and Bunun vocabulary help students connect with their heritage, fostering a sense of pride and belonging. Displays of the Bunun language provide daily opportunities for students to practice their mother tongue, while teachers subtly integrate cultural elements into lessons, validating Indigenous traditions. However, this inclusion is often performative, as deeper cultural content remains absent from the curriculum, which prioritizes mainstream Han Chinese and Western knowledge. This disconnect can leave students feeling embraced socially but alienated academically.

Non-Bunun teachers, exposed to these symbols, develop an appreciation for Bunun culture, promoting cross-cultural understanding. Such interactions encourage multicultural harmony and prepare students for a globalized world.

# 2. The Struggle for Cultural Identity in Education

Despite visible cultural symbols, Bunun students face a deeper struggle within an education system rooted in Han Chinese norms. They are pressured to excel academically while

maintaining their Indigenous identity, often feeling disconnected from a curriculum that overlooks their heritage.

Globalization and academic success exacerbate this tension, as students navigate dual pressures from their families and the system. Teachers, though sympathetic, lack resources to integrate Indigenous knowledge, leaving students emotionally and intellectually strained. Barthes' semiotic analysis reveals that while visible symbols validate identity, the system's structural inequities persist.

#### 3. The Myth of Multiculturalism in Indigenous Education

The display of Bunun cultural symbols creates a façade of inclusivity but fails to achieve genuine integration. Barthes' concept of myth highlights how these symbols promote the illusion of diversity while masking systemic marginalization.

Symbols give Bunun students a sense of belonging but remain disconnected from the curriculum's dominant focus on Han Chinese and Western content. This superficial approach fosters a false sense of cultural respect, leaving the deeper needs for curricular transformation unmet. Students encounter Bunun symbols without critical engagement, perpetuating shallow understanding rather than meaningful interaction. True multiculturalism requires moving beyond symbolic gestures to integrate Indigenous knowledge into education.

#### Conclusion

Roland Barthes' semiotic theory offers valuable insights into the relationship between signs and their socio-cultural contexts, providing a lens through which to examine the impact of campus symbols on Bunun students' cultural identity. This study analyzed the denotative and connotative meanings of key symbols at Bunun Elementary School A—the Bunun woodcut calendar, diamond totems, the phrase "禮義廉恥," and signs promoting cultural diversity—and their influence on students' cultural identity.

This study highlights three critical insights. First, culturally significant symbols like the woodcut calendar and diamond totems strengthen Bunun students' cultural identity but lack deep integration into the curriculum. Second, Bunun students face cultural identity struggles, navigating the pressures of mainstream education, globalization, and their Indigenous heritage. Third, multiculturalism risks becoming a myth in Indigenous education, with symbolic inclusion masking the marginalization of minority cultures in Taiwan's educational system.

In conclusion, achieving genuine cultural integration in education requires meaningful curricular reforms that balance Indigenous and mainstream cultural values. Addressing this challenge is vital for fostering equity and cultural recognition in Taiwan's education system.

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#### Middle Management: Role, Practices and Challenges on Educational Leadership Practices

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#### Abstract

Recent studies highlight the significant impact of middle management leadership on educational success. In Catalonia, school leadership is managed by a team composed of the Principal, Head of Studies, and Secretary. This research, using a sequential mixed-method design divided in three phases, analyses the functions of the Head of Studies in primary schools and the needs that arise from their role. The study provides a focused analysis of this often-overlooked role, including a gender perspective. Data was collected through a questionnaire with a reliability of 0.904 in Cronbach's Alpha and semi-structured interviews. The Phase 1 sample included 362 participants, 20.4% of whom were held the role of Head of Studies, with the majority being women (89.2%). Phase 2 focused on eight participants in leadership positions. The study evaluated 62 management functions across four dimensions (D1: leadership; D2: management, D3: pedagogical; D4: professional development), attributing seven key functions to the Head of Studies, including leadership, implementation of educational practices, teacher coordination, and academic scheduling. Results from the Confirmation and Chi-Square tests emphasize the importance of the Head of Studies in the pedagogical dimension (D3) and, to a lesser extent, in promoting professional development (D4). However, training gaps and a lack of specific support for the role were identified, underlining the need for further research to enhance middle management in Catalan schools. This study offers an integrated understanding of the Head of Studies' role, emphasizing their significant involvement in educational leadership while revealing deficiencies in training and support. These insights could inform the development of targeted educational policies and training programs specifically designed to enhance the effectiveness and impact of this crucial role.

Keywords: Educational Leadership, Middle Management, Management Team, Head of Studies

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#### Introduction

International studies highlight the growing interest in examining the roles, practices, and responsibilities of middle leaders in schools (Motshaki et al., 2022). Although there is limited evidence demonstrating a direct impact on student learning, Tang et al. (2022) agree on the potential influence that middle leaders' practices have on teaching and learning. According to research by Highfield et al. (2022), the actions of middle leaders have a direct and significant impact on students' academic outcomes, particularly in disadvantaged settings.

An analysis of three models of middle leadership practices (Grootenboer, Edward-Groves, Rönnerman, 2020; Highfield et al., 2022; Tang et al., 2022) emphasizes that key functions of this role include leading teaching teams, supporting staff development, and creating conditions for both individual and collective success. Gairín and Armengol (1996) had already noted that effective educational practices require the commitment of teaching staff and sufficient knowledge. Therefore, in addition to pedagogical responsibilities, they attributed to the Head of Studies an important role in fostering teachers' professional development. However, these authors also highlighted the need to define and delimit the role's functions to provide appropriate training. Tang et al. (2022) similarly note that middle leaders often have limited experience in these functions, underscoring the importance of targeted professional development specifically adapted to the real responsibilities they carry out.

To review the legal framework governing the duties of the Head of Studies, it is necessary to refer to Royal Decree 82/1996, of January 26, which approves the Organic Regulations of Infant and Primary Education Schools. Subsequent laws offer no new or additional information. The RD 82/1996 establishes that the Head of Studies is responsible for coordinating and supervising all academic activities, ensuring the effective implementation of the educational project, curricular projects, and the general annual program (e.g., preparing and fulfilling academic schedules, organizing academic events, managing tutorial activities). Additionally, the Head must promote ongoing teacher training and support school community engagement. In the absence of the Director, the Head of Studies assumes their functions, according to current regulations.

Within the leadership team, the Head of Studies serves as a liaison between the administration, school management, community, families, and students (Highfield, 2010). Fundamentally, this role focuses on the management, implementation, coordination, and supervision of academic activities, as well as promoting teacher professional development through fostering a positive educational climate and culture (Cuadrado, 2010; Leithwood, 2016).

The growing recognition of middle leaders' importance in educational institutions highlights the need for further research into the role of the Head of Studies. It is essential to deepen the understanding of how this role is carried out in schools and to explore key issues related to it (Edwards-Groves et al., 2016; Motshaki et al., 2022). This study aims to thoroughly analyze the specific functions of the Head of Studies within the leadership team, identifying potential training or other needs arising from this role. Through this research, the goal is not only to better understand the Head of Studies' responsibilities but also to propose strategies to optimize their performance and address the challenges associated with their educational leadership.
### Method

The research presented is part of a broader mixed-method study, structured in three phases: quantitative-qualitative-qualitative. The results discussed correspond to Phases 1 and 2. The objective of Phase 1: Quantitative, where an ad hoc multi-response questionnaire was applied, is to identify the functions attributed to each position within the school leadership team, specifically focusing on those assigned to the Head of Studies. In Phase 2: Qualitative, semi-structured interviews were conducted based on Phase 1 results, aiming to explore the professional development needs of the Head of Studies related to their responsibilities.

### Instrument Validation

The questionnaire was validated through expert judgment, involving four theoretical and five practical experts. Based on their feedback, adjustments were made to improve the instrument. Internal consistency was evaluated using Cronbach's Alpha, which yielded a coefficient of 0.904, indicating high reliability. Upon reviewing the 62 questionnaire items, no significant improvements were found by removing any, further confirming the instrument's robustness.

The semi-structured interview design and validation were based on Phase 1 results, focusing on function attribution according to the position held in the leadership team. Three interview guides were developed, consisting of a common section addressing general questions on school leadership and a specific section with questions tailored to the functions associated with the respondent's role.

### **Participants**

The total sample in Phase 1 comprised N = 362 participants, with 20.4% holding the position of Head of Studies. When disaggregating the role by gender, it was found that 89.2% of Heads of Studies were women, compared to 10.8% men. Notably, 40% reported receiving no specific training for their role (see Figure 1).



Figure 1: Training Profile of the Head of Studies

This finding is confirmed by the responses collected in Phase 2, where one of the Heads of Studies commented:

F2E8: "(...) We lack the knowledge of how the day-to-day of a Head of Studies works. You can have the information, sure, but it's all very general. In my opinion, there should be a more natural way of training Heads of Studies once they take on the role, especially in management aspects, because a big part of the job is about management. For example, dealing with leaves, substitutions, and how to create schedules."

In Phase 2, the sample included N = 8 participants: six Directors, one Head of Studies, and one Secretary. Of these, six were women and two men. The participants were selected from the Phase 1 sample, and all agreed to continue participating in subsequent stages of the study. All participants stated that they engage in continuous professional development, with most training provided by the Department of Education or other recognized institutions. Courses covered a wide range of topics, including didactics, curriculum, linguistic investment plans, methodologies, office automation, educational innovation, and digital tools.

# Results

This section is organized around a detailed analysis of the 62 leadership functions (see Appendix 1) distributed across four key dimensions: institutional leadership, management of the educational organization, management of teaching and learning processes, and promotion of staff development within the school. Firstly, the functions assigned to each leadership role—Headmaster, Head of Studies, and Secretary—are outlined in Phase 1, providing a comparative view of their respective involvement in these dimensions. Secondly, the Phase 2 results highlight the priorities, challenges, and professional development needs associated with these dimensions, emphasizing their significance for the effective performance of school leadership.

The analysis shows that, out of the 62 functions, seven are directly attributed to the Head of Studies.

	5				
No. items	Dimensions / Charge	HD	HS	SE	NO MT
11	D1: Institutional Leadership	10	0	1	0
23	D2: Management of the Educational Organization	18	4	1	0
14	D3: Management of Teaching and Learning Processes	11	3	0	0
14	D4: Promotion of Staff Development	14	0	0	0
62	Total	53	7	2	0

Table 1: Total Number of Items by Role and Dimension

These include tasks such as implementing school projects (D2F2), preparing academic timetables (D2F7), coordinating committees (D2F11), and overseeing teaching teams (D2F12). The Head of Studies also plays a key role in ensuring the curriculum is properly aligned (D3F1), driving improvements in teaching and learning processes (D3F4), and leading educational practices (D3F5). These functions collectively highlight the Head of Studies as a pivotal figure in ensuring smooth coordination and a cohesive school environment, while also significantly contributing to pedagogical development and academic success.

Considering the cumulative responses by role, the Head of Studies has the highest level of involvement in the pedagogical dimension, with an 80% attribution rate, followed by a 70% rate in staff professional development.



Figure 2: Cumulative Percentage by Dimension for the Role of Head of Studies

These results align with those of the inferential analysis, where the Head of Studies consistently exceeded expectations in terms of responsibility, outperforming the Headmaster's responses in seven functions (Graph 3). This confirms the critical role of the Head of Studies in the pedagogical dimension. In D4, dimension related to staff development, the Head of Studies also showed slightly elevated results, though without standing out significantly.



In the Chi-Square test, there was a noticeable trend where participants tended to self-attribute functions based on their role (Graph 4). Of the 38 functions with statistically significant

results, the Head of Studies self-attributed 29, though not all functions aligned with the legal framework. Notably, 20 functions were self-assigned by multiple leadership roles, even though they were not specifically designated in legal frameworks.



Figure 4: Representation of Statistically Significant Values in the Chi-Square Test

In Stage 2, the analysis was structured into three categories: priorities, challenges, and professional development needs, across the four leadership dimensions. In D1: Institutional Leadership, the Head of Studies' priorities include strategic planning, defining the school's mission and vision, and, crucially, communicating these core elements to the rest of the team. The main challenge identified was in evaluating progress and determining whether objectives were being met. Additionally, there was a recognized need for improvements in school climate and meeting management.

In D2: Management of the Educational Organization, both the priority and challenge converged on timetable creation, with specific training needed in this area for optimal performance.

Regarding D3: Management of Teaching and Learning Processes, the Head of Studies emphasized the importance of setting educational objectives, not just planning them but sharing and coordinating with the team to achieve them. A key challenge was knowledge of the legislation and curriculum, highlighting the need for guidance and support in performing pedagogical functions.

Finally, in D4: Promotion of Staff Development, both priorities and challenges centered on identifying teachers' training needs. There was a strong emphasis on training related to team management, with the aim of fostering their professional and emotional development.

### Discussion

The findings of this study align with international research highlighting the critical role of middle leaders in educational settings. While previous studies, such as those by Motshaki et al. (2022), emphasize the growing interest in understanding middle leadership, the results of this research provide new insights into the specific role of the Head of Studies in schools. Consistent with Highfield et al. (2022), this study confirms that middle leaders, Head of Studies in the territory of Catalonia, have significantly influence in teaching and learning processes, particularly through their coordination and leadership of pedagogical initiatives. However, it also reflects Tang et al.'s (2022) assertion that the direct impact of this role on student outcomes is complex and mediated by other factors.

In terms of practice, the functions identified in this study closely resemble those described by Grootenboer et al. (2020), highlighting the importance of leading teaching teams, managing educational projects, and fostering professional development. These alignments support the notion that the Head of Studies' responsibilities go beyond administrative tasks, emphasizing their pivotal role in shaping educational outcomes.

The findings highlight discrepancies between the functions outlined in Royal Decree 82/1996 and the external and self-attributed responsibilities reported by participants. This misalignment underscores the need to update and clarify the regulatory framework to better align with the evolving demands of school leadership. Moreover, the study reveals significant overlap in responsibilities among leadership team roles, particularly the self-attribution of functions not explicitly assigned by law. Addressing these overlaps through clearer role definitions could enhance collaboration, reduce redundancy, and optimize the effectiveness of leadership teams.

The cumulative total of responses attributed to the role of the Head of Studies in Dimension 3 (Management of Teaching and Learning Processes) accounts for 80% of the responses, while in Dimension 4 (Promotion of Staff Development), it represents 69.8%. This aligns with Gairín and Armengol's (1996) early recognition of the Head of Studies' influence in driving professional development and ensuring effective teaching practices.

The consistency between the Phase 1 functions and the Phase 2 priorities and challenges indicates coherence in the perception of the role across participants. For example, the emphasis on staff development in D4 reflects both the priorities of the Head of Studies and their challenges in managing and supporting teaching teams. Similarly, the focus on timetable creation in D2 highlights the dual need for technical expertise and strategic planning in this area.

Finally, the findings corroborate Tang et al.'s (2022) observation of middle leaders often lacking sufficient training in their specific functions. The identification of priorities and challenges, such as gaps in legislative knowledge and the need for training in team management, confirms that targeted professional development is a key requirement for optimizing their performance.

# Conclusions

The study confirms that the Head of Studies plays a central role in coordinating pedagogical processes and fostering the professional development of teaching staff. This is particularly evident in the management of teaching and learning processes (Dimension 3) and the promotion of staff development (Dimension 4). Specifically, 80% of the functions attributed to the role fall under Dimension 3, while 69.8% relate to Dimension 4, highlighting the Head of Studies' significant contributions in these critical areas.

Discrepancies were identified between the functions established in the current legal framework and the responsibilities attributed by participants. These gaps underscore the need to update and clarify the regulatory framework to better reflect the evolving demands and realities of school leadership.

The analysis revealed significant overlaps in responsibilities among different leadership roles within the team. Certain functions were self-attributed by the Head of Studies as well as by other members, despite not being explicitly assigned in the legal framework. This overlap highlights the need for clearer role definitions to optimize collaboration and reduce redundancy within leadership teams.

The results show strong coherence between the functions identified in Phase 1 and the priorities, challenges, and training needs outlined in Phase 2. This consistency indicates a shared understanding of the role, emphasizing areas such as staff development, pedagogical coordination, and strategic management as key priorities for improving the performance of the Head of Studies.

Significant gaps in the training of the Head of Studies were identified, particularly in areas such as educational legislation, team management, and the development of strategic and pedagogical skills. This highlights the need for targeted, role-specific professional development programs to enhance their effectiveness and address the challenges associated with their responsibilities.

# Limitations and Future Investigations

One limitation of this study lies in the limited representation of the Head of Studies in the Phase 1 quantitative analysis. Given that schools often have a single institutional email address, which is typically accessed by one person, it restricted the possibility of obtaining responses from all three members of the leadership team. This occurred despite clear instructions in the contact email emphasizing the importance of responses from all leadership roles. Additionally, while the qualitative phase provided valuable insights, there is room to explore the specific needs and challenges of the Head of Studies in greater depth, a focus that will be addressed in Phase 3 of the research. Finally, it would be valuable to replicate this study in other educational contexts to analyse how the findings may vary across different cultural and regulatory settings.

# Appendices

**Appendix 1.** The 62 functions identified in the exercise of leadership in educational organizations

DI: Institutional Leadership
D1F1 Plans the school's goals.
<b>D1F2</b> Establishes the school's vision-mission.
D1F3 Promotes an internal network of relationships.
<b>D1F4</b> Facilitates the establishment of a network with external entities.
D1F5 Leads the school's educational project.
<b>D1F6</b> Promotes communication channels to encourage participation.
<b>D1F7</b> Tracks the progress of the school's leadership team.
<b>D1F8</b> Resolves internal team conflicts.
<b>D1F9</b> Provides suggestions on institutional planning.
D1F10 Manages internal communications.
<b>D1F11</b> Establishes criteria for the budget project.
D2: Management of the Educational Organization
D2F1 Plans school projects.
D2F2 Implements school projects.
D2F3 Evaluates school projects.
D2F4 Analyses environmental opportunities.
D2F5 Integrates contextual features into school projects.
D2F6 Solves day-to-day contingencies.
<b>D2F7</b> Prepares academic schedules
<b>D2F</b> A Organizes academic events
D2F9 Coordinates extracurricular activities
<b>D2F</b> Coordinates of the School's Organization and Functioning Rules (NOFC)
D2F1 Coordinates school committees
D2F12 Coordinates teaching teams
<b>D2F12</b> Coolumnates tearsing teams, <b>D2F12</b> Solution to the second secon
D2F14 Manages the administrative system
D2F14 Manages und administrative system.
<b>D2F</b> 15 Dians use school's Annual Report. <b>D2F</b> 16 Davidues propagals for tagging staff profiles for interim vacancies according to the school project.
D2F10 Develops proposals for reacting start promes for internit vacancies according to the school project.
D2F17 Manages the methin start selection process.
D2F16 Outlanders the rights and duties of the school community members.
D2F19 Distributes leadership functions among team internoets.
D2F20 Coordinates the implementation of the General Annual Planning.
D2F21 Evaluates the overall functioning of the school.
D2F22 Ensures compliance with Occupational Risk Prevention.
D2F23 Executes the school's emergency protocol.
D2F23 Executes the school's emergency protocol. D3: Management of Teaching and Learning Processes
D2F23 Executes the school's emergency protocol.         D3: Management of Teaching and Learning Processes         D3F1 Supervises the alignment of the school's methodology with the curriculum.         D2F2
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D4F9 Promotes shared school responsibilities.

**D4F10** Communicates the school's vision-mission.

**D4F11** Ensures a positive school climate.

D4F12 Designs the induction program for new staff.

D4F13 Participates in staff evaluation processes.

D4F14 Assesses the capabilities, characteristics, and preferences of teaching staff for determining vacancy assignments.

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### The Orienta4VET Interactive Guide: A Tool for Guidance in Vocational Education and Training

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### Abstract

The Orienta4VET project, a transnational Erasmus+ initiative, highlights the importance of guidance in Vocational Education and Training (VET) in Germany, Denmark, Portugal, Romania, and Catalonia (Spain). This article presents results from the Catalan context. The objective of the project is to raise the visibility of VET by analysing the risk factors that may affect its students and offer practical strategies to prevent school dropout. The team conducted semi-structured interviews and focus group discussions in 21 VET centres, including eight in Catalonia, focusing on four key dimensions: guidance, holistic approach, systematic approach, and empowerment. Data were organised in a Microsoft Word matrix to facilitate international collaboration and were thematically analysed using MAXQDA, employing coding and categorisation to identify connections between variables and dimensions. In Catalonia, 70 risk factors were identified across five dimensions: personal, family, social-relational, institutional, and structural-systemic, aiding in understanding the challenges faced by VET students. This analysis enabled the development of the Interactive Guide Orienta4VET, a dynamic and accessible tool for VET counsellors, administrators, and tutors. The Guide's strategies are organised according to the identified risk factors, facilitating their consultation and application based on the specific needs of VET centres. The Orienta4VET project represents a significant contribution to public policies and education. The Interactive Guide is useful for guidance professionals and offers a model for analysing factors affecting student trajectories in VET. By providing access to proven and innovative methods, the guide enhances the educational experience and success of VET students in Catalonia and other contexts.

Keywords: Dropout Risk Factors, Vocational Education and Training, Vocational Guidance, Dropout

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### Introduction

The Orienta4VET initiative was implemented to address issues pertaining to socioeducational integration and enhance accessibility and retention in vocational education and training (VET). Funded by the European Erasmus+ Programme's Key Action 2 Vocational Education and Training (KA220-VET), the project aims to support disadvantaged youth. Its objectives include increasing the prominence of VET by identifying factors that contribute to student attrition and determining effective strategies for VET centre staff to mitigate dropouts. The project's primary deliverable is a user-friendly guide designed to facilitate the implementation of guidance and tutorial activities in VET environments. This resource is accessible on the Orienta4VET Project Website (www.orienta4vet.eu).

# Theory and Context of Catalonia (Spain)

Catalonia, Spain has been focusing on addressing dropout rates in Vocational Education and Training (VET) programs (Mora et al., 2022). The introduction of the Dual VET system, which emphasises increased workplace learning and greater business involvement compared to traditional school-based VET, is one such initiative (European Commission, 2023). A comprehensive analysis of Catalonia's entire VET student population data spanning four academic years (2015-2016 to 2018-2019) revealed the positive effects of Dual VET on student grades and graduation rates (Mora et al., 2022).

The research considered various factors that could influence academic performance and graduation, including student characteristics, school features, and program specifics. The results showed that Dual VET had a significant and robust positive impact on grade and degree completion, even after accounting for selection bias and different model specifications. While factors such as online/blended learning and private school ownership also affect completion rates, Dual VET demonstrates a more pronounced influence (Mora et al., 2022).

Early leaving from education and training (ELET) remains a critical issue across Europe, affecting one in ten young people, with notable disparities observed across countries, regions, genders, and specific population groups (CEDEFOP, 2023). Addressing ELET is a key policy priority for many European nations, with the EU countries aiming to reduce the average proportion of early leavers to below 9% by 2030 (CEDEFOP, 2023).

CEDEFOP (2023) noted that vocational education and training (VET) programs in some countries face high dropout rates. However, high-quality, inclusive, and flexible VET provisions may help to prevent and address ELET. To address this issue, Cedefop conducts research on early departure from VET, collects and analyzes national data on dropout rates, and publishes comparative and national reports. Additionally, Cedefop has developed two resources: The VET toolkit for tackling early leaving, and The VET toolkit for empowering NEETs (young people not in education, employment, or training). These resources offer practical assistance to VET professionals and policymakers by providing materials from various European nations to stimulate reflection, discussion, and decision-making processes aimed at tackling early exits from VET or supporting young NEETs (CEDEFOP, 2023). In Catalonia, the ELET rate has seen a reduction of 2.5 percentage points over the past year, now standing at 14.8%, although it remains the 5th highest among Spanish autonomous regions (Fundació Bofill, 2022). Additionally, a notable gender disparity exists, with ELET rates of 9.9% for females and 19.4% for males. Other variables such as geographical

background, parental education level, and household income also influence ELET rates in Catalonia (Fundació Bofill, 2022).

Non-profit organisations play a vital role in tackling the issue of students leaving vocational education and training (VET) programs in Catalonia. These third sector entities often work in partnership with educational institutions and governmental bodies to deliver support services and implement strategies to improve student retention and achievement.

A notable illustration is the work of Fundació Catalana de l'Esplai, a non-profit organisation committed to promoting educational and social inclusion through recreational activities and community involvement (Salvà et al., 2019). They have created programs specifically aimed at preventing early school departure and assisting at-risk youth in completing their VET studies (Salvà et al., 2019). These initiatives frequently incorporate hands-on learning experiences, mentorship, and efforts to cultivate a sense of belonging in the educational community.

Furthermore, organisations such as Fundació Privada Ateneu Sant Roc collaborated with VET schools to provide comprehensive support to students (Rodríguez et al., 2012). These services encompass academic guidance, career advice, and personal growth workshops, all intended to address various factors that may contribute to dropout rates. By offering a holistic approach to student support, these third-sector organisations fulfil a crucial function in ensuring that students have access to the resources and guidance necessary for success in their VET programs.

Practical learning experiences and community engagement are crucial for improving retention rates in vocational education and training (VET) programs in Catalonia (Salvà et al., 2019). VET refers to educational courses designed to provide students with the practical abilities and knowledge required for specific occupations or trade (Salvà et al., 2019). Retention denotes the capacity to keep students enrolled and engage in VET programs (Salvà et al., 2019). A crucial element in enhancing retention rates is the integration of practical learning experiences into the VET programs. These hands-on components enable students to implement theoretical concepts in practical scenarios, cultivate a more profound comprehension of their chosen discipline, and boost their determination to complete the program. Such experiences encompass internships, apprenticeships, project-centred learning, and simulated work settings tailored to specific vocational domains.

Moreover, community initiatives have been shown to play a vital role in supporting student retention in VET courses. These endeavours typically involve cooperation among educational establishments, local enterprises, and community groups, generating opportunities for students to interact with their potential professional environments and develop a sense of connection within the wider community. These initiatives include mentoring schemes that connect students with industry professionals, vocation-related community service projects, networking events, job fairs, and lectures delivered by industry specialists.

By nurturing connections between students, educational institutions, and the local community, these initiatives can heighten students' motivation, expose them to real-world scenarios, and underscore the relevance of their VET studies. The analysis conducted in Catalonia likely involved quantitative data and metrics related to VET enrolment, completion rates, and other relevant outcomes. By examining the impact of experiential learning and community involvement strategies on these metrics, researchers and policymakers can gain

valuable insights into effective approaches to improve student retention and overall success in VET programs.

Studies on attrition rates in vocational education and training (VET) programs in Catalonia have employed a comprehensive methodology incorporating both macro- and micro-analyses (Gairín et al., 2012). The macro analysis used quantitative and qualitative data from the UNEIX platform, which contained information on 21,620 dropouts in the Catalan University system from 2000–2001 to 2001–2002 years (Gairín et al., 2012). These data offer insights into variables related to students' circumstances at the commencement of their degree, factors influencing the degree of abandonment, and post-dropout situations (Gairín et al., 2012). The microanalysis encompassed detailed and comprehensive examinations through in-person and telephonic interviews with a test group of students who left their studies. This qualitative method seeks to evaluate dropout rates with greater intricacy, taking into account variables like academic/vocational guidance, learning processes, degree motivation, student-institution interactions, institutional backing, and personal/economic elements (Gairín et al., 2012).

A separate investigation examined the degree to which VET learners utilised motivational and self-regulated learning (SRL) strategies, contrasting students in online and traditional classroom VET programs (Quesada-Pallarès et al., 2019). This study validated the adaptation of three scales measuring task value, effort regulation, and metacognitive self-regulation for Catalan VET students. The findings indicated no significant disparity in task value between online and classroom VET learners; however, online students exhibited higher levels of metacognitive self-regulation and effort-regulation (Quesada-Pallarès et al., 2019).

Moreover, a significant study explored the influence of Dual VET on students' grades and course completion in Catalonia. Dual-VET incorporates more practical training and business involvement than conventional school-based VET (Mora et al., 2022). The study revealed that Dual VET positively affects grades, with instrumental variable (IV) estimation showing a more substantial impact than ordinary least squares (OLS) results. Specifically, Dual VET enhances grades by 0.51 points on a 0-10 scale, or 0.93 standard deviations when standardising grades (Mora et al., 2022). It also boosted the likelihood of course completion by 1.77 percentage points, which is 3.88 times the average value. The study accounted for sample selection bias and employed an instrument related to the availability of Dual VET programs near students' schools to address endogeneity (Mora et al., 2022).

# Methods

The Orienta4VET project employed a qualitative research methodology, specifically thematic analysis (Braun & Clarke, 2022; Sundler et al., 2019), to conduct this study. This approach was selected for its efficacy in examining the complex perspectives of principals and teachers serving as guidance counsellors in Vocational Education Training (VET) centres throughout Catalonia, Spain. This qualitative study investigated the pivotal role of guidance in VET, aiming to enhance both educational outcomes and successful integration into the workforce.

# **Data Collection**

Eight locations in Catalonia, Spain, were selected for semi-structured interviews and group discussions. This approach was adopted because of its proven efficacy in obtaining comprehensive and contextually rich data, enabling a thorough investigation of participants' insights, expertise, and viewpoints (Cohen et al., 2018). These interactions play a crucial role

in understanding the intricate ways in which VET influences educational and occupational integration.

The data collection was structured around open-ended enquiries centred on four principal aspects: Guidance, Holistic approach, systematic approach, and focus on empowerment. These aspects were chosen to encompass the fundamental components essential for evaluating the efficacy of the VET programs. To enhance collaborative efforts among the international partners engaged in the project, the information was methodically arranged using Microsoft Word matrix. This platform was selected because of its widespread availability and user-friendly nature, which are vital for coordinating the intricate logistics of a research project spanning multiple countries (Braun & Clarke, 2022).

### Analysis

After gathering the data, the next crucial phase involved transcribing interviews and discussions. This process, which converts oral communication into a written form, is essential for facilitating a more comprehensive and accessible analysis. Upon completion of transcription, initial coding was conducted using the MAXQDA software. This stage entailed breaking down the transcripts into discrete information units, which were then labelled with codes corresponding to preliminary themes based on the study's four dimensions.

The MAXQDA coding process enabled the identification and categorisation of similar themes across the dataset. This was accomplished through meticulous data synthesis to uncover recurring patterns and expressions related to the key dimensions. As themes emerged, they underwent continuous refinement and grouping, facilitating the discovery of connections between various themes and sub-themes (Williams & Moser, 2019; Rädiker & Kuckartz, 2021). This step is vital as it offers a profound understanding of the systemic and individual factors influencing dropout rates among young people in VET, as well as identifying strategies employed by teachers and counsellors to prevent such occurrences.

The analysis continued with an in-depth examination of how these themes interacted within the broader ecological framework provided by Bronfenbrenner's Ecological Systems Theory (Brofenbrenner, 1979). This theoretical approach aided in categorising and organising the identified themes into systemic levels, including personal, family, social-relational, institutional, and structural-systemic factors. Each category reflects a different layer of influence on students' educational experiences and outcomes, ranging from immediate personal interactions to wider societal and cultural forces.

The final stage involved synthesising the findings from this thematic analysis to develop the Interactive Guide, a key research output of the Orienta4VET project. This guide incorporates identified best practices and insights, addresses risk factors, and promotes innovative teaching and learning strategies. It is structured to assist practitioners and policymakers in implementing effective strategies to enhance VET education and reduce dropout rates, reflecting the interconnected nature of the risk factors affecting students in educational settings.

### Results

# **Risk Factors for School Dropout in VET Youth**

The development of the Interactive Guide was based on a comprehensive research approach rooted in Bronfenbrenner's ecological model complemented by insights from Stepanović-Ilić et al. (2017). This framework enables the systematic identification and examination of multi-tiered risk factors influencing VET students' educational paths. Employing Bronfenbrenner's perspective, the initiative sought to categorise the wider societal elements contributing to student attrition. This categorisation arranges risk factors into readily comprehensible groups, while recognising their interrelations across various levels (Brown et al., 2021):

- Personal Factors: Situated within the microsystem, encompassing aspects such as a learner's drive, mental state, and particular educational requirements, directly influenced by their immediate personal and social encounters.
- Family Factors: Positioned in the microsystem, these elements are shaped by household dynamics, backing, and aspirations. The mesosystem links these familial components to educational contexts, thereby impacting student outlooks and achievements.
- Social-Relational Factors: Embedded in the microsystem, this category encompasses interactions such as companionships and peer associations within the school setting. The mesosystem examines how these social connections influence students' interactions with the family and community, affecting both social and academic spheres.
- Institutional Factors: Spanning the exosystem and mesosystem. These elements include broader educational guidelines, assets, and managerial practices that indirectly shape students' learning environments. Their interplay with the family and community dynamics within the mesosystem is crucial for establishing supportive educational frameworks.
- Structural-Systemic Factors: Located in the macrosystem, these comprise the broader cultural, societal, and economic conditions that define the overarching context of the education system, influencing how education is valued, accessed, and aligned with labour market demands.

These categories demonstrate the multifaceted and interconnected nature of risk factors that affect students in their educational settings. Each plays a vital role in molding academic outcomes and experiences.

### Creation of the Orienta4VET Interactive Guide

The creation of the Interactive Guide for Orienta4VET was a carefully planned initiative designed to address the significant attrition rate among VET learners. This project encompassed a multi-stage approach that blended research with practical applications guided by input from VET experts.

The initiative commenced with the comprehensive identification of multi-tiered risk factors affecting VET students. Extensive research has uncovered roughly 70 distinct risk factors across five primary categories: individual, family related, socio-relational, institutional, and structural-systemic. These factors were systematically categorised based on their characteristics and influence, establishing a solid foundation for understanding the intricate

challenges faced by VET students, which is essential for identifying areas that require targeted interventions.

The next phase involved assessing current orientation and tutorial approaches through interviews and dialogue with stakeholders from VET centres in Catalonia, Spain. This evaluation was crucial for gathering insights into existing practices and identifying areas for improvement. The feedback obtained during this stage was vital for understanding the efficacy of current strategies and their relevance to VET students' needs.

Utilising the insights gained from the preceding phases and contemporary research, the subsequent steps involved adapting and refining strategies to address the identified challenges. A set of 13 innovative strategies, each accompanied by specific actionable measures, were developed for implementation within VET centres to enhance educational outcomes and reduce attrition rates. These efforts culminated in the development of an Interactive Guide, as illustrated in Figure 1.



Figure 1: Orienta4VET Interactive Guide Source: https://orienta4vet.eu/statics/view/interactive\_guide

This Interactive Guide serves as a versatile and accessible resource for synthesising extensive research and proven methodologies to aid VET instructors and managers. By offering readily available access to established techniques and innovative approaches, the Interactive Guide acts as a crucial tool for improving the learning journey and outcomes of VET learners, thereby making a substantial contribution to the vocational education sector.

# Discussion

The Orienta4VET initiative has made considerable progress in tackling the pressing issue of student attrition in vocational education and training (VET) throughout Catalonia, Spain. By identifying roughly 70 distinct risk factors across personal, family, social-relational, institutional, and structural-systemic domains, this project established a comprehensive framework for comprehending the complex challenges VET students encounter. This groundwork was crucial for identifying areas requiring targeted interventions and informing subsequent project phases.

An assessment of current guidence and tutorial approaches yielded valuable insights into the practices employed within VET centres. Conversations with stakeholders illuminated the strengths and weaknesses of these methods, offering a clear picture of the areas needing enhancement. Feedback from this stage was vital in refining strategies to better suit VET students' needs.

Drawing on these insights, this project devised a set of 13 innovative strategies, each accompanied by specific actionable measures aimed at improving educational outcomes and reducing dropout rates. The culmination of these efforts is an Interactive Guide, which is a dynamic and user-friendly tool that encapsulates the project's extensive research and tested strategies. By providing easy access to proven methods and novel approaches, the Interactive Guide serves as a crucial resource for VET educators and administrators.

The project's methodological approach, rooted in thematic analysis and informed by Bronfenbrenner's Ecological Systems Theory (Brofenbrenner, 1979), has demonstrated its effectiveness in capturing the intricate and interconnected nature of factors influencing VET student outcomes. This approach enables a nuanced understanding of how various environmental and individual factors interact to affect educational success, thereby providing a robust foundation for developing practical and actionable strategies.

Overall, the Orienta4VET project has made a significant contribution to the field of vocational education and training by offering a deeper understanding of the risk factors associated with school dropout and providing practical tools to address these challenges. The Interactive Guide, as a primary output, exemplifies the project's success in promoting educational and professional integration among disadvantaged young people in VET environments.

# Conclusion

The Orienta4VET initiative has successfully crafted an interactive guide that combines the intricacies of multi-tiered risk elements with pragmatic approaches for guidance and tutorial interventions. This resource is invaluable for educators and administrators to bolster the educational journey and achievement rates of VET learners, particularly those from underprivileged backgrounds. The project outcomes make a substantial contribution to the VET sector by offering a flexible and scalable solution to curtail dropout rates and foster socio-educational integration.

The project's research revealed shared risk factors and useful measures to address them. A notable discovery was the effectiveness of the Dual VET system in mitigating dropout rates. The integration of workplace training and heightened corporate engagement not only enhanced academic performance but also improved student retention. This dual methodology shows the potential of blending practical work experiences with academic instruction to create a more captivating and pertinent educational experience for VET students.

Moreover, the project underscored the significance of robust guidance and support frameworks for reducing dropout rates. By delivering continuous assistance and personalized guidance, VET institutions can better cater to the diverse requirements of their students, particularly those at risk of leaving their studies. The involvement of skilled counsellors and implementation of structured tutorial actions play a pivotal role in nurturing a supportive learning environment.

Collaboration and community engagement have emerged as crucial elements in the success of VET programs. Involving local enterprises, community organisations, and other stakeholders ensures that educational offerings align with local labour market needs and that students receive comprehensive support throughout their educational journey. This collaborative approach not only enhances the relevance of VET programs but also cultivates a sense of belonging and community among students.

It is crucial to note that all measures identified and implemented through the Orienta4VET project are intrinsically linked to local systems. There is no universal solution; instead, interventions must be tailored to the specific contexts and needs of each community. This localisation ensures that the strategies are relevant and effective in addressing the unique challenges faced by VET students in different regions.

Further research is recommended to build upon the findings of the Orienta4VET project and to explore additional dimensions of VET effectiveness and student retention. Future studies should focus on investigating the long-term impacts of Dual VET programs on students' career trajectories and overall satisfaction, conducting comprehensive evaluations of different guidance and support systems to identify the best practices, and exploring various models of community engagement to develop more robust collaborative frameworks. Additionally, research should develop and test personalised intervention strategies catering to individual student needs, particularly those with complex risk profiles, and assess the role of technology in enhancing VET education, including the use of digital tools and platforms to deliver guidance and support services. By pursuing these research avenues, stakeholders can continue to improve VET programmes, making them more inclusive, effective, and responsive to the needs of all students.

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### Breaking Neoliberal Rules: Meeting the Other

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#### Abstract

Training tame workers, nurturing empty children and adolescents who need skills that are expendable hic et nunc. Schools are becoming large discount stores (McLaren, 2015) and young people, like ghosts in the corridors, are increasingly struggling with a latent disorientation, a pervasive sense of loneliness and resignation. Sartre's statement "L'enfer c'est les autres" (1944) seems to have been adopted as the leitmotif of the neoliberal system. The symptomatic landscape of fragility is dramatic, but there is a lack of greater concern for the stories of these young people, which are less and less listened to. In this sense, an exploratory study with a qualitative-quantitative methodology was carried out, during the school year 2022/2023 in some high schools in the provinces of Padua and Treviso (Italy). Among the core elements attributed to adolescent fragility, increasing relational difficulties (Barone, 2018), become the focus of our research. Starting from a critical emancipatory perspective (Denzin & Lincoln, 2023), the data collected return many suffering Italian students (35% of the 'fragile' adolescents' state that they have never communicated their state of malaise to their classmates), but someone who retains a democratic soul: 33% of the participants state that they have often experienced support and solidarity from their classmates. A widespread sense of isolation and loss of self-identity raises the educational challenge of rediscovering the value of the other, of relationships, and of promoting a school that is a guardian of democratic values (Giroux, 2018), including an emotional development (Mortari, 2017). The choice is ours alone.

Keywords: Classmate Relations, Critical Pedagogy, Adolescents' Fragility, Loneliness, Relationships, Democratic Society

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### Introduction

Talking about adolescence should lead us to talk about life, vital energy and future, but nowadays we only read and listen about death and destruction.

According to Peter McLaren, the spread of neoliberal ideology contributes to transform schools as large discount stores (2015), where both child, youths and adults try to collect competences and skills (Baldacci, 2019) to answer the law of the heart: be your own best businessman.

Even if recent scientific literature reports that adolescents are increasingly affected by various psychological disorders, i.e. depression, anxiety, eating disorders, violent and aggressive behaviours, different kind of addictions, etc. (Meherali, 2021; Pedrini, 2022; WHO, 2024), much less effort has been spent on studying how these discomforts are related to school life experiences and the influence they have on peer relationships. Trying to fill this lack, a study focused on the wellbeing in the classroom was carried out to find out the perceived level of disease and fragility experienced by these young people. Many researchers and professionals are deepening and studying this phenomenon, and some of them define it as an "existential disease" (Barone, 2009; Bruzzone, 2022), a hidden illness disguised as apparent wellness.

Starting from the previous studies and evidence, we try to understand how students feel in this atmosphere of competitiveness and solitude (Turkle, 2011), interpreting the mentioned symptoms of malaise as a way to communicate disease in this toxic contemporary "palliative and pain-free society", as Han asserted (2021).

### **Research Design**

# Research Paradigm

The epistemological lens through which we would view the reality of the Italian school is a critical one, according to the critical emancipatory approach of Denzin and Lincoln (2023). In this sense, our research project would not only know the lived experience of Italian adolescent students but would also become a tool through which they could become aware of their condition by expressing their feelings and frustrations. Giving a voice to those who don't have one is one of the tasks of the emancipatory approach (Giroux, 2005, p. 205), and this is what we have done. To be able to speak, to have a voice, could mean for these young boys and girls that for the first time they could see in writing what they were feeling, which until that moment had only been an internal, often unacknowledged feeling. The concretisation of something that was previously vague or denied could lead them to reflect on their fragility, to recognise it, and perhaps to do something to change their perspective on themselves and others (Mayo, 2007, p. 23).

### Aims

Considering the increasing number of adolescents diseases, our research group of the University of Padua, proposed and conducted an observational study focused on wellbeing in the classroom, involving some high schools (lyceums, technical and vocational schools) of two provinces of the West North of Italy- Padua and Treviso. Data were collected from September 2022 to October 2023 during the school year.

The principal objective was to ascertain the impact of the link between malaise and peer relationships, given the established correlation between the two factors in the existing literature. The main question was: How have relationships with peers been affected by the experience of illness.

# Population

We enrol 157 students, from five different secondary schools. As this was a pilot study, we elected to employ a non-randomised sampling methodology choosing a convenience sample. Contact was made with several schools in the region via email. Of the aforementioned schools, a number of teachers expressed interest in participating in the research project. The most significant challenges encountered in the recruitment process pertained to technical and scientific institutions, coupled with the challenge of conveying to managers and teachers the critical urgency of this matter. A total of 157 boys and girls, aged between 14 and 20, participated in the study, with data collected from eight classes. The mean age of respondents was 17.2 years, with a greater proportion of females (57.3%) than males (40.1%) participating in the study. Furthermore, 2.5% of respondents indicated that they did not wish to provide a gender designation. The majority of respondents are Italian, with a minority of different nationality. The family composition is characterised by a significant proportion of adolescents residing with only one of their biological parents, due to circumstances such as divorce, separation or loss of the other parent.

# Materials and Methods

In order to address the research question, an ad-hoc questionnaire was developed based on a review of existing validated questionnaires. This process yielded the formulation of a brief, semi-structured questionnaire comprising five questions. Two were closed questions and three were open-ended. The initial section was devoted to a biographical analysis, encompassing the respondents' names, surnames, provenance, family composition, and age. The subsequent section centred on the perception of personal wellbeing. The objective was to ascertain the level of wellness or illness perceived by the students. Furthermore, the aim was to gain insight into the potential impact of distress on the quality of student relationships with their peers. The questionnaire was created using Google Forms.

Approximately one to two weeks prior to the in-person administration of the questionnaire, the research team instructed teachers to collect completed forms (for both informed consent and for data processing). As the majority of students were minors, only those who had obtained the requisite parental consent were permitted to participate in the study.

The duration of our intervention for each class was one hour. During the initial stages, we presented the research findings, elucidated the content of the questionnaire, and collected the requisite signed forms. The remaining time was dedicated to the completion of the online questionnaires, shared to their smartphones through a link. The teachers were present throughout the duration of the research, together with the researcher. The remaining time allowed for further discussion with the pupils regarding the issues raised in the questionnaire.

The choice of questionnaire was influenced by the reluctance of educational institutions and teachers to invest their valuable time in the programme. Conversely, the teachers themselves played an indispensable role in establishing the prerequisites for the implementation of the

survey. In order to safeguard the voice of the adolescents, a number of open questions were incorporated, which were subsequently subjected to qualitative analysis.

### Ethical Issues

Research involving minors on sensitive topics demands special consideration, particularly given the average age of the population is 17.2 years and a significant proportion of this age group constitutes minors. This prompted us to undertake a detailed ethical analysis of our research project.

The aforementioned forms were employed for the purposes of obtaining informed consent to the research and for data processing. The aforementioned forms were provided to the families of the minors and the 18 participants a week or two in advance of the session, allowing sufficient time for them to read and digest the information presented.

### **Results and Discussion**

Given that the proposed questionnaire included both closed questions on a Likert scale and open questions, our analysis will be divided into two distinct parts: a quantitative data analysis and a qualitative analysis.

The quantitative data was analysed using Excel worksheets, while the qualitative data was analysed using the paper-and-pencil technique. The initial section of the inquiry sought to identify the nature of the malaise, the degree of internal cohesion within one's social group, and the quality of interpersonal relationships with one's peers in relation to one's state of malaise. The second part of the study permitted a freer and less guided clarification and expression of the subjects' states and emotions.

### Quantitative Data

The initial observation was the considerable proportion of participants who reported experiencing some form of discomfort: 64.3%. This finding corroborates prior research on adolescent malaise in the context of contemporary consumerist society (Turkle, 2011; McLaren, 2015; Giroux, 2018; 2021; Pedrini, 2022).

The initial question of the questionnaire presented a list of various types of experienced discomfort, from which respondents could select the four most impactful. The four most frequently indicated were psychological and mental discomfort, episodes of violence, and specific learning disorders (SLD). Regarding gender differences, no discernible pattern emerges in responses, and psychological distress emerges as the most significant factor for both sexes.

Conversely, with regard to the perceived levels of internal cohesion, a notable discrepancy emerges between boys and girls. The previous literature about school belonging also corroborates the observation that girls tend to perceive lower levels of internal cohesion (Schnepf et al., 2023). Moreover, there appears to be an inverse correlation between cohesion and the impact of discomfort on relationships. As one variable increases, the other decreases. This finding lends support to our initial hypothesis concerning the pivotal role and 'therapeutic' function that an authentic relationship can assume, even in the context of one's own vulnerability and fatigue.

A key finding was the impact of SLD, which was identified as the most prevalent form of malaise, with an average score of 6.7. In contrast, the female population appears to be more significantly affected by mental disorders and exposure to violence, with an average of 6.7 points and a distance of more than 1 point on the scale measuring the perception of the level of internal cohesion.

Furthermore, an investigation was conducted into the most prevalent forms of malaise and the level of impact that the male students perceived in the cohesion of the class. Additionally, the diverse reactions exhibited by classmates when confronted with their own experiences of discomfort were examined. The options presented were as follows: solidarity, assistance if possible, indifference, teasing and offence.

Of particular concern is the high percentage of participants who reported experiencing indifference from their peers in response to their situation. Furthermore, a considerable proportion of respondents indicated that they had never disclosed their circumstances to their classmates. The partial explanation for this behaviour can also be found at the level of qualitative analysis, which may include a need for confidentiality, a desire to be invisible, and a reluctance to mix personal and school life.

Fortunately, only 3% of respondents stated that they had experienced insults and teasing. In addition to these, a significant percentage of respondents reported having experienced and continuing to experience supportive and positive relationships. Of these respondents, the majority were female.

# Qualitative Data

While the qualitative analysis allowed us to consolidate the findings of the quantitative analysis, it also enabled us to gain deeper insights into the phenomenon under observation. This revealed that young people have a strong desire to be listened to and understood when they are experiencing emotional distress or malaise.

At first glance, it appears that there is a reluctance to share one's discomfort with classmates, with family, partners or best friends being the preferred choice. The decision to confide in a select few individuals, who are not part of the school environment, appears to be a common practice.

"I try to live with it and keep most things inside by talking about it *only with people close to me like my mum, dad, sister or a few friends* with whom I am very close." (45M)

"My mates or people in general do not notice if I am sadder than usual or if I have something because *I tend not to show it to other people*, if I want to talk about it I talk to my *boyfriend*." (16F)

"Only a close friend of mine knows." (106F)

This desire to maintain a clear and distinct boundary between one's personal and academic lives is a recurring theme. This separation is, in fact, an illusion and is highly counterproductive, even with regard to the development of knowledge and skills. In order to

facilitate student empowerment, it is essential that classrooms become "democratic public spheres, sites of possibilities" (McLaren, 2015).

Some respondents denounce a certain degree of indifference and selfishness on the part of their peers, while others express a sense of sadness and loneliness.

"A *little bit sorry* because I was hoping for a more united class and instead *everyone thinks of themselves.*" (65F)

*"Bad* because I don't really feel that I have someone who cares about me, I *don't feel understood*. I *feel so lonely*, so much; although I always have people around." (75F)

"I don't want my companions to know about my personal life, I *don't want to be vulnerable*." (122F)

A minority point to their peers as being responsible for an increase in their state of anxiety.

"Bad, it's already difficult to cope with what's going on outside school and when I go into the classroom I sometimes *feel even worse* because of dirty looks and obvious signs of disdain." (121F)

"Even some of them give me *extra anxiety*." (60F)

"I get twice as agitated when they get agitated with me." (49F)

A considerable number of respondents indicated that their experience of class life was characterised by a sense of normality and passivity, but fortunately, a significant proportion of respondents indicate positive experiences of relationships with their peers, including feelings of relational well-being and enjoyment.

"I feel wanted, it gives me the feeling that *I count for something in the class.*" (157F)

"I am *happy* because *I feel important to someone* and I know I can count on some of them." (68F)

"The one time I opened up *I received a lot of support* because a lot of kids are having a hard time because of school." (111M)

# Conclusions

A widespread sense of isolation (Turkle, 2011) and loss of self-identity (Barone, 2018; Han, 2021) raises the educational challenge of rediscovering the value of the other, of relationships, of sharing personal and emotional states (Nussbaum, 2006; Mortari, 2017) with peers and of promoting a school that is a guardian of democratic values (McLaren, 2015; Giroux, 2018). A glimmer of hope emerges from this generation, which has endured significant challenges and fatigue: "I would like to trust some of my companions more" (153M).

As Heidegger suggests centuries ago Care is an essential mode of being, a part of the ontological dimension of the human being (1927). For this reason we could say that caring is

the essence of the human condition and that the promotion of loneliness is nothing more than a capitalist tactic to destroy the freedom and vitality of human beings. Since schools are one of the places where humanity should be cultivated, it is up to us to decide whether we should start watering, ploughing and fertilising the soil again or leave it to the mercy of pesticides.

We believe that the pedagogical/educational response to the current malaise of our young people is to be found in the recovery of an ancient and truly human practice ... of entering into authentic relationships, recognizing the face of the Other (Ricoeur, 1998). Nothing new or innovative.... Simply exercising our humanity, our vocation as men and women, as responsible and aware citizens, with rights and duties.

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# Simulation-Based Learning: Integrating ERP Systems in Business Education at Coimbra Business School

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### Abstract

Simulation-based learning (SBL), assisted by computer programs, has gained prominence in various scientific fields as an effective methodology for training qualified professionals to develop their future activities in this context. This approach was also adopted by Coimbra Business School, which a few years ago decided to introduce this teaching method into one of its business science courses. This experience has led to the creation of this article, which aims to present and discuss this active teaching method in the context of using Enterprise Resource Planning (ERP). The methodology used in this study is descriptive and exploratory, aiming to provide a detailed account of the teaching method employed at Coimbra Business School and to discuss its advantages for teaching business sciences (accounting, taxation, management, etc.). The study is based on information gathered through questionnaires from students who attended the course three years ago and are now practicing professionals in the job market. The results indicate that the use of simulations with ERP not only increased student engagement and motivation but also significantly improved their ability to apply theoretical knowledge in practical situations. These results suggest that integrating simulations into ERP teaching is an effective approach for training professionals who are better prepared for the challenges of the current job market.

Keywords: Simulation-Based Learning, Enterprise Resource Planning, Active Teaching Method, Business Education

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### Introduction

Business management and modern accounting increasingly rely on reliable and timely financial information, which is essential for decision-making and the economic performance of organizations. In this context, Enterprise Resource Planning (ERP) systems have become indispensable tools, enabling the integration of processes such as sales, purchasing, treasury, and human resource management, while offering companies a holistic view of their operations (Charland et al., 2015).

Accounting, as a fundamental information system, addresses both internal and external demands and is currently supported by integration with other systems. This integration not only allows the generation of financial reports and tracking of source documents but also enables efficient resource management, enhancing market competitiveness (Zhang, 2023). Accounting education must follow this trend, preparing students for the growing use of information technologies, especially ERP systems, thus bridging the gap between education and professional reality.

Teaching in this context presents significant challenges (Léger, 2006). Many students, lacking practical experience in business environments, find it difficult to understand the benefits of ERP system parameterization and integrated usage. To overcome these challenges, active teaching methods that promote students active participation in the learning process and practical application of acquired knowledge, such as Simulation-Based Learning (SBL), emerge as effective approaches to align education with professional realities.

SBL aims to replicate the complexity of real-world environments, providing practical business experiences in a safe setting without risks to actual companies (Aldrich, 2003). This method has been applied in disciplines such as strategic management and accounting, for example, in simulating complete accounting cycles, from transaction recording to the preparation of financial statements. These activities enable students to understand the impact of business operations on decision-making (Mitchell, 2004; Sparling, 2002; Springer & Borthick, 2004).

Sidorova and colleagues (2023) highlight that, in the current context of technological evolution, higher education must adequately prepare students for the demands of the job market. In this regard, the inclusion of simulation in curricula is presented as a relevant strategy.

Léger (2006) developed a specific approach to this type of active learning, describing a simulation game designed to teach ERP concepts. His research concluded that students involved in the simulation demonstrated better assimilation of ERP concepts, underscoring the effectiveness of this pedagogical strategy for teaching enterprise systems.

Recognizing the benefits of this methodology, the objective of this article is to present the experience of Coimbra Business School | ISCAC in implementing SBL in the Business Simulation I (BSI) course unit, highlighting its advantages, challenges, and future perspectives.

### Literature Review

Throughout history, education has undergone numerous transformations, reflecting changes in educational theories, societal needs, and available technologies. Traditionally, education was characterized by a knowledge transmission model, where the teacher was the sole holder of knowledge, and students were passive recipients. This model, based on lectures and memorization, placed little emphasis on the practical application of knowledge or the development of critical skills necessary for the real world.

With advances in educational psychology and cognitive sciences, learning is now understood as an active and constructive process. Active teaching methodologies have thus gained prominence, offering a student-centered approach that fosters more effective learning and the development of essential skills for professional success. When applied, these methodologies create dynamic, engaging, and effective learning environments (Duchatelet et al., 2022).

SBL, increasingly adopted in higher education, replicates real-life events or conditions, providing students with the opportunity to develop skills in a controlled environment. This is particularly useful in contexts where real situations are dangerous, rare, or complex, making them unsuitable for direct learning opportunities (Faber et al., 2023; Heitzmann et al., 2023; Vermunt, 2023).

McAlpin and colleagues (2023) define simulations as realistic environments that allow users to interact with models of situations and phenomena. Simulations provide an approximation of real-world practice, enabling students to build knowledge through real and interactive tasks (Dai & Ke, 2022). This environment fosters the development of competencies required for the parameterization and effective use of integrated systems (Bauer et al., 2022). Moreover, SBL facilitates the practice of complex or critical skills often encountered in real-world environments (Hanus et al., 2022; Vermeiren et al., 2022).

The effectiveness of SBL is widely recognized in promoting critical thinking, problemsolving, and deep learning. Studies show that well-designed simulations can significantly enhance student performance in complex tasks (Chernikova et al., 2020; Urquidi Martín & Tamarit Aznar, 2017). To maximize the effectiveness of SBL, it is crucial to create a safe and non-judgmental learning environment, where mistakes are viewed as opportunities to correct and consolidate knowledge (Madsgaard et al., 2022).

Despite its benefits, implementing SBL poses certain challenges. In the context of ERP education, the need for advanced technological resources, such as laboratories equipped with updated software, can be financially demanding for some institutions (McAlpin et al., 2023). Another challenge is the adaptation of students to a highly technical and interconnected environment, particularly for those without prior experience with integrated systems.

Additionally, the complexity of simulated business processes demands detailed and ongoing preparation from instructors to ensure that the simulations are both realistic and pedagogically effective. These challenges underscore the importance of careful planning and institutional support to maximize the benefits of SBL in educational contexts.

# Methodology

This article employs two complementary methodological approaches: a case study and the use of structured questionnaires. The case study focuses on describing and analyzing the implementation of the SBL method in the curricular unit of BSI at Coimbra Business School | ISCAC. This approach allows for an exploration of the methods dynamics, from planning to execution, highlighting pedagogical and operational aspects.

Simultaneously, structured questionnaires were administered to gather data on students' perceptions and experiences during the past two academic years. The questionnaire included both closed and open-ended questions, enabling the collection of both quantitative and qualitative data. The questions addressed three main areas:

- Learning Impact: To understand how the SBL method influenced students' comprehension of ERP concepts and their practical application of acquired knowledge.
- Skill Development: To assess the development of technical and interpersonal skills relevant to the job market.
- Satisfaction and Motivation: To measure students' satisfaction and motivation levels compared to traditional approaches.

The collected data were analyzed descriptively to identify general trends and interpret students' qualitative perceptions. Open-ended questions in the questionnaire provided deeper insights into the methodology's relevance to their training. For instance, students were asked to describe the main challenges faced during the simulation and to highlight the skills they felt were most developed, such as financial analysis, ERP usage, and teamwork. These responses enriched the analysis, complementing the quantitative results and offering a more comprehensive understanding of the methodology's impact.

# Case Study: Coimbra Business School | ISCAC

The application of the SBL methodology was integrated into the curriculum of Coimbra Business School | ISCAC with the objective of bridging academic education with the realities of the business world. This approach is particularly relevant for accounting and management courses, where the practical application of theoretical concepts is fundamental to preparing students for their professional careers.

The case study presented here describes the implementation of SBL in the curse unit of Business Simulation I. This practical example illustrates the benefits and challenges associated with this teaching method, reinforcing its importance in higher education.

# Implementation of Simulation at Coimbra Business School | ISCAC

The BSI curse unit was introduced into the curriculum to provide students with a comprehensive practical experience, focusing on integrating the theoretical knowledge acquired throughout the course. Among the key pedagogical objectives are:

- Understanding the administrative and legal procedures necessary for company formation.
- Developing competencies in organizing and classifying accounting documents in environments close to business reality.
- Mastering the functionalities of an ERP system, exploring the coherence and articulation of data between modules such as Management, Human Resources, Assets, and Accounting.
- Interpreting financial and accounting reports generated by the ERP, with a focus on informed decision-making.
- Practically applying business concepts, promoting the development of entrepreneurial and managerial skills in a simulated environment.

This approach has been successfully assessed with students in the undergraduate programs in Accounting and Auditing and Business Management at Coimbra Business School | ISCAC, receiving broadly positive feedback, as students tend to prefer learning through practice.

The BSI methodology is divided into three phases: i) Introduction to ERP; ii) Business plan development; iii) Creation of the simulated company, business development using ERP, and data analysis.

Classes are held in labs equipped with ERP software, ensuring accessibility for all students. Each professor is responsible for 24 students, organized into six groups of four. With a workload of 3 hours of practical sessions per week, totaling 90 hours of contact time per semester, the maximum number of groups per professor is limited to six, ensuring effective guidance and quality pedagogical interaction.

In this setup, the professor acts as a consultant, guiding the working groups. This approach is based on the principle that students are responsible for developing their simulated business, while the professor acts as a facilitator with whom they share and discuss ideas. The professor adopts a pedagogical guidance role, fostering critical thinking and discussion on relevant topics and activities rather than directly executing tasks. According to students, this model has significantly contributed to forming competent professionals aligned with current market demands.

## Introduction to ERP.

To enable students to use ERP software effectively in this curse unit, an introductory session is necessary to familiarize them with its functionalities. This phase introduces students to ERP systems widely used in real business contexts, providing a first-hand experience with market-applied technological tools.

During the first four weeks of classes, the professor demonstrates ERP functionalities using an expository method to explain the connections facilitated by the software, including managing procurement, sales, treasury, human resources, and assets. Additionally, the integration of accounting entries within the accounting module is explained, enabling, after automatic registration, the generation of essential accounting reports for decision-making and legal compliance.

## Business Plan Development.

In parallel, students select a business area for their simulated company and develop a business plan to evaluate the feasibility of their idea. To align the simulation with real business scenarios, common rules are defined, encouraging students to include typical company activities such as applying for subsidies and acquiring specific assets.

This phase includes a market analysis of the chosen business area, sales projections, and estimation of necessary expenses for the simulated company, such as materials, services, human resources, and assets.

By analyzing financial projections, students determine the initial capital required for the company, allocating it between equity and debt. The business's feasibility is assessed based on financial reporting and related economic-financial indicators, enabling them to move forward with the creation of the simulated company and guide the simulation of current operations.

#### Creation of the Simulated Company and Business Development.

From the fifth week onward, students use the ERP software to simulate the formation and daily operations of a company over two months. They are responsible for decisions related to investment, financing, hiring human resources, accounting records, and all activities inherent to the development of the chosen business activity.

During this period, accounting, fiscal, and management challenges are also presented, exposing students to real business scenarios within a controlled environment. Monthly, students conduct analyses of trial balances, account statements, and management support reports, evaluating the efficiency of their resource management. This process includes audits conducted with the professor's support, who also assists in closing accounts at the end of the simulation.

The final week is dedicated to the final analysis of financial and management reports, identification of potential errors, and submission of the electronic dossier documenting all the simulated company's operations.

The schedule presented in Table 1 outlines the main stages and tasks carried out during the business simulation, from week 5 to week 11.

Week	Task	Description
Week 5	Simulation of	Introduction in ERP of inventory purchases, assets, services, and
	November	payments processes.
Week 6	operations	Introduction in ERP of human resource elements and payroll
		processing. Recording of operational expenses in treasury.
Week 7		Preparation of sales and receipts processes. Integration of
		transactions into accounting.
		Organization of the generated documents in the company dossier.
Week 8	Analysis of	Audit: Review of reporting maps and decision-making.
	November	Analysis of November trial balances.
Week 9	Simulation of	Introduction in ERP of purchase and payment processes.
	December	Recording of operational expenses in treasury.
Week 10	operations	Payroll processing and simulation of compliance with related
		obligations.
Week 11		Preparation of sales and receipts processes.
		Integration of transactions into accounting.
		Organization of the generated documents in the company dossier.

Table 1: Schedule of Activities for Business Simulation I

In Table 2 is presented the schedule outlines the main stages and tasks carried out during the business simulation, from week 12 to week 15.

	Table 2: S	chedule of Activities for Business Simulation I
Week	Task	Description
Week 13	Simulation of year-end	Calculation of the cost of goods sold and consumed, estimation of accrued expenses, processing of depreciation and amortization, and
Week 14	operations	Organization of the generated documents in the company dossier.
Week 15	Business analysis and final trial balances	Students present final financial reporting maps, including the evolution of sales and expenses, as well as final trial balances. Submission of the simulated company dossier.

It is important to highlight that the goal of BSI is not solely to learn the processing of a company operational transactions but also to analyze and interpret the data generated by the ERP system to make informed management decisions. Students assume the role of managers of their own companies, where they evaluate and manage resources. Among other management tasks, they develop treasury skills by analyzing cash flows and interpreting trial balances, account statements, and journals generated by the ERP system, thus strengthening their knowledge and abilities as accountants and managers.

The described environment places the student at the center of the learning process, allowing them to apply theoretical knowledge in real-life scenarios and prepare for the challenges of the job market.

#### **Results and Discussion**

The implementation of BSI at Coimbra Business School | ISCAC has brought significant benefits to students, aligning academic education with the demands of the labor market. According to Jossberger and colleagues (2022), simulation in higher education allows students to face professional challenges without the risks associated with real-world scenarios. In the case of BSI, students take on the role of managers, making business decisions in a protected environment, which fosters a practical understanding of complex concepts. Among these concepts are inventory management, treasury, and finance, as well as the use of integrated ERP systems, which, when properly configured, enable nearly automatic accounting processes. These competencies are essential to meet current market demands.

Additionally, BSI, with the support of professors, provides a safe pedagogical environment for students to understand the consequences of errors and learn from them. This academic guidance is essential, replicating real-world business situations in the classroom and guiding students toward applying the best solutions to presented problems. This interaction not only enhances students' confidence but also allows for a more structured development of their practical skills. Although the study does not provide direct evidence regarding employers perceptions of these competencies, literature suggests that skills such as ERP system usage and the ability to interpret financial reports are highly valued in the labor market (Léger, 2006; Mitchell, 2004). This connection between practice and professional environments underscores the relevance of this method in preparing well-qualified professionals.

The benefits of this methodology have been confirmed by surveys conducted with 75 students who attended the course unit over the past two academic years. Approximately 73.6% of respondents reported feeling more motivated by this teaching method, while 86.8% highlighted that the simulation helped them understand theoretical concepts in practical scenarios. These results underline the effectiveness of BSI in providing a meaningful learning experience closely aligned with business realities.

Despite the positive results, the implementation of this method presents challenges. The lack of integration with external entities such as tax authorities and social security limits the authenticity of the experience, restricting the simulation of more realistic scenarios. Additionally, the manual preparation of supporting documents, usually received from suppliers, proved to be a labor-intensive task for students, diverting focus from more strategic and pedagogical activities within the simulation.

These challenges highlight opportunities for improvement, such as developing digital tools that automate document preparation and allow for the simulation of interactions with external entities. Implementing these solutions could enrich students' experiences, making the simulation even more effective and aligned with the corporate environment.

#### Conclusion

This article presented the implementation of the SBL methodology in the BSI course unit at Coimbra Business School | ISCAC. Through a combination of case study and surveys applied to 75 students, it was possible to identify clear benefits and challenges of this pedagogical approach.

The results show that SBL promotes a practical learning experience highly valued by students, aligning academic education with labor market demands. By integrating complex concepts such as management, accounting, and the use of ERP systems to support them, the methodology enables students to develop technical and interpersonal skills essential for professional environments. The high motivation and enthusiasm of students confirm the effectiveness of the method, highlighting it as an efficient tool in higher education.

However, challenges such as the lack of connection with external entities and the manual preparation of documents point to the need for additional innovations, such as the development of specific digital tools to minimize these obstacles and enhance the authenticity of the simulations. These improvements could not only enrich the learning experience but also strengthen its connection to real business practices.

Thus, we conclude that the BSI experience highlights the potential of SBL as an effective methodology for preparing students for the challenges of the labor market. We hope that the presented results encourage other institutions to adopt similar approaches, promoting the development of better-prepared professionals aligned with current market dynamics. We hope that the results presented can encourage other institutions to adopt similar approaches, promoting the training of better prepared professionals aligned with current market dynamics.

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## A "Design Thinking Traits" Based Study on Project-Based Pedagogies in Architectural Education in the 21st Century

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#### Abstract

The architectural profession in the 21st century faces new, unprecedented challenges. An equipped generation of architects with a large set of cross-disciplinary skills shall be required to rise up to these challenges. This study, rooted in the context of architectural education, analyses the impact of pedagogical approaches on the development of "Design Thinking Traits", collaboration, empathy and integrative thinking. While these traits have been recognized as important for design education, the measurement of their degree of integration in pedagogical practices is lacking. Utilizing a qualimetric methodology, we analysed 28 international design case studies, we identified 14 distinct "Project-Based Pedagogy" approaches and 12 cross-disciplinary skills that contribute to the enhancement of these traits. We found that a combination of critical pedagogy and transformative learning, implemented within a "Live Project" (experiential and social), fosters Cross-disciplinarity and nurtures the three "Design Thinking Traits". This study highlights the evolving roles, postures, and relational dynamics between different actors (teachers, students, external stakeholders) in these increasingly collaborative and interdisciplinary learning environments. It, also, underscores the underestimated skills, such as curiosity, negotiation, shared leadership and empathy. Overall, this research provides insights for educators and researchers seeking to shape pedagogical approaches to meet the evolving demands of architectural and design education in general, ensuring that students are equipped with the necessary skills to thrive in the dynamic landscape of the 21st century.

Keywords: Design Thinking Traits, Project-Based Pedagogies, Architectural Education, Cross-Disciplinary Skills, Design Education

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# **1. Introduction: Design Thinking Traits and Project-Based Pedagogies: An Analytical Framework for Architectural Education in the 21st Century**

The 21st century confronts the architectural profession with multifaceted challenges, mainly societal changes, technological advances, environmental concerns and the growing demand for socially responsible architectural practice, necessitating a profound transformation of the discipline and its education (Aydemir 2017; Blanckaert et al., 2019; Boudhraâ, 2020; Breed & Mehrtens, 2022; Charalambous & Christou, 2016; KamrowskaZałuska & Parteka, 2020; Salama & Wilkinson, 2007). Future architects need to develop much more than technical expertise (Freitas & Almendra, 2021; Holubchak, 2020); They must acquire a wide range of cognitive, metacognitive, interpersonal (Avsec & Jagiełło-Kowalczyk, 2021) and social (Breed & Mehrtens, 2022) skills to thrive in this dynamic landscape. Architectural education must be transformed by adopting pedagogical approaches that prepare students for these new realities (Salama, 2021). Despite the recognition of the importance of these cross-disciplinary skills (communication, empathy, teamwork, critical thinking, etc.), the existing literature does not offer structured methods for evaluating their integration into Project-Based Pedagogical<sup>1</sup> experiences, partly due to the lack of consensus on the classification of these competencies and the difficulties inherent in their measurement (Freitas & Almendra, 2021, p. 2).<sup>2</sup> The Project-Based Pedagogy<sup>3</sup> appears to be a powerful and adaptable tool for cultivating these skills. It is essential to recognize that it has evolved considerably since its first applications. Several key elements have enriched it. John Dewey (1910), a philosopher, psychologist, and educational reformer, emphasized experiential learning and its social dimension, while Bronwyn Davies (2016), a sociologist and educational theorist, explored uncertainty and freedom in learning. By immersing students in real-world design scenarios, this pedagogical approach fosters leadership, complex problem-solving and many other cross-disciplinary skills, preparing them for the ever-changing reality of architectural practice.

In this context, "Design Thinking",<sup>4</sup> increasingly recognized as essential for meeting the challenges of the 21st century in education (Luka, 2014; Shareef & Farivarsadri, 2020) is not just a reproducible methodology or a pedagogical approaches. It is a mindset and a way of thinking (Coleman, 2018), that is developed through experience (Ghonim, 2016), characterized by a set of traits such as collaboration, empathy, integrative thinking (Blizzard et al., 2015; Brown, 2008). These traits are observable via a set of competencies that

<sup>&</sup>lt;sup>1</sup> This lack of structured methods is highlighted by several authors. For example, Freitas and Almendra (2021) note the absence of an evaluation system adapted to collaboration in education, while Katoppo and Sudradjat (2015) insist on the need to develop research methods that take into account the subjective and contextual nature of architecture.

<sup>&</sup>lt;sup>2</sup> The lack of consensus on the classification of transversal skills is highlighted by the diversity of approaches proposed in the literature. For example, (Khodeir et Nessim, 2020) classify these skills into three domains – cognitive, interpersonal and intrapersonal – while Freitas and Almendra (2021) propose a classification into four categories: cognitive, meta-cognitive, interpersonal and social. Additionally, the measurement of these skills is often hampered by their subjective and contextual nature. As Habraken (2007) points out, architectural judgment, which is an essential transversal skill, depends on multiple factors (social, functional, political, etc.) and cannot be evaluated in a purely objective manner.

<sup>&</sup>lt;sup>3</sup> "Project-Based Pedagogy" although mentioned as early as the 16th century in the context of architecture, saw its true theorization in the 20th century with the work of educationalists such as John Dewey, Maria Montessori and Jean Piaget. William H. Kilpatrick, a disciple of Dewey, laid the first concrete foundations of the project-based approach in 1918 in his book The Project Method. The project-based approach developed as a reaction to traditional teaching methods, deemed too passive and disconnected from the realities of life. It emphasizes active learning, concrete problem-solving and collaboration between students (Tessier 2021, 16)

<sup>&</sup>lt;sup>4</sup> "Design Thinking" is a complex concept that can be understood both as a cognitive style specific to designers (Cross, 1982; Schön, 1983; Rowe, 1987; Lawson, 1997; Cross, 2006; Dorst, 2006) and as a general theory of design introduced by Buchanan (1992) in his article entitled "Wicked Problems in Design Thinking" as shown by Kimbell (2011) in "Table 1: Different ways of describing design thinking". (P 15). "Design thinking is not a type of knowledge that can be taught theoretically, but rather is a skill that should be practiced and learnt through solving real-life problems (Lawson, 2005; Kimbell, 2011). Design education aims at producing mentalities that are capable of thinking originally and independently. It also aims at preparing qualified designers who can adapt" (Ghonim, 2016)

demonstrate mastery of "Design Thinking", such as teamwork, creative thinking, leadership (Avsec & Jagiełło-Kowalczyk, 2021; Todoroff et al., 2021). It is within this perspective of a mindset expressed through specific competencies that "Design Thinking" offers a relevant analytical framework for measuring the degree of integration of the 12 cross-disciplinary skills identified in our study and grouped under the three following "Design Thinking Traits":<sup>5</sup>

**Empathy:** "Imagine the world from multiple perspectives (T.Brown, 2008), Think as a part of a team in a social process (Dym et al.2005) where design is socially situated (Schön 1983)" (Todoroff et al. 2021). It goes beyond the mere consideration of "human" to extend to the "non-human" elements of design (the physical, social and cultural context) (Laplace 2023), and it is acquired through immersion, social interaction activities and participatory design methods (Holubchak 2020).

**Integrative Thinking:** is a complex systems thinking that enables us to approach design problems creatively and holistically (Dym et al., 2005), taking into account all the dimensions of the problem (technical, social, environmental, economic, etc.), and mobilizing analytical, intuitive and imaginative skills (Toit et al., 2024).

**Collaboration**: "Ability to work with many different disciplines and often have experience in more than just one field" to achieve a common goal. (Blizzard et al., 2015 as cited by Todoroff et al., 2021). It's a dynamic, interactive process that requires shared or distributed leadership, flexibility in adapting to challenges, and the ability to negotiate to reach consensual solutions.

The main objective of this study is to verify whether empirical observations, derived from case studies, confirm the hypothesis that certain pedagogical approaches foster the development of "Design Thinking Traits" in architectural education.

To achieve this we propose a qualimetric<sup>6</sup> approach to assess the integration of crossdisciplinary skills in a design studio pedagogical experiences. This method, based on the analysis of qualitative data, is particularly well-suited to the study of complex, subjective phenomena. Our research aims to answer:

Which "Studio-Based Pedagogy" approaches best cultivate "Design Thinking Traits" in architectural education?

To answer this question, the study will:

- Identify "Studio-Based Pedagogical" approaches that address the notion of crossdisciplinary skills.
- Assess the degree of integration of each "Design Thinking Trait" into these pedagogical experiences.

<sup>&</sup>lt;sup>5</sup> "Design Thinking Traits", represent a combination of common attitudes, skills and cognitive processes which caracterized "Design Thinking" found in different design disciplines, despite their specificities. These traits, summarized in "*Table 1 Design thinking traits based on literature*" (Todoroff et al., 2021, 2), come from the work of Blizzard et al. (2015) and Brown (2008).

<sup>&</sup>lt;sup>6</sup> "Qualimetric Analysis" is a hybrid evaluation method that combines qualitative and quantitative approaches. In the context of our study, it is based on textual analysis (qualitative), and the use of a binary scoring system (quantitative). The combination of these two methods will enable us to identify correlations between pedagogical approaches and "Design Thinking" traits in the design studio.

# **2.** Literature Review: Evolution of Project-Based Pedagogies in 21st-Century Architectural Education

This literature review offers an in-depth overview of the current state of architectural education in the 21st century, highlighting the diversity of pedagogical approaches that foster cross-disciplinary skills. These approaches emphasize real-world problem-solving and collaborative competencies crucial in today's complex, interdisciplinary design landscape. Through our analysis, we identified 14 new variations in the evolution of Project-Based Learning (PjBL), as summarized in the table below. These variations reflect the adaptation of PjBL principles—such as experiential and student-centered learning grounded in real-world contexts—to address contemporary challenges, including the need for greater student autonomy, equitable power dynamics, and hybrid learning environments.

Pedagogy	Salacted refreezes	Specific Focus
i cuagogy	(Share of at animore dri	specific Focus
Challenge-Based Learning (CBL) (n=2)	(Shareel et arivarsadri, 2020) (Acuńa et al, 2017)	Tackling real-world, complex issues with societal impact, often on a global or local scale
Competency-Based Learning (CBL) (n=1)	(Acuńa et al., 2017)	Focused on the acquisition and mastery of specific, measurable skills and directly applicable in a professional context.
Design Thinking (n=7)	(Avsec et Jagiełło- Kowalczyk, 2021)	Applying a human-centered design approach
Live-Project (n=3)	Breed et Mehrtens 2022 BLANCKAERT et al. 2019	Engaging in projects with real-world clients or stakeholders, often with specific deliverables
Design andBuild/Learning- By-Making (LBM) (n= 3)	BLANCKAERT et al. 2019 Delpire 2019	Integrating the entire life cycle of a building, from design to construction.
Inquiry & Research- Based / oriented Learning (n=5)	Nyka et al 2020 Charalambous 2016 Michael K. Jenson Abdelmonem 2014	Investigation, research skills and the production of new knowledge. emphasises learner autonomy, investigation, discovery and the development of critical thinking skills.
Service Learning (n=1)	Wan et al 2012	Active participation in solving concrete problems in the community, combining community engagement with the enhancement of citizenship.
Co-design Learning (n=1)	Boudhraâ 2020	Collaborative project design with equal participation of stakeholders, shared ownership and co-construction of knowledge and solutions.
Transformative Learning (n=1)	Breed et Mehrtens 2022	Encouraging self-reflection and critical examination to transform personal beliefs and perspectives of students
Game-Based Learning (GBL)/ Interactive playful learning (n=1)	HOLUBCHAK 2020	Using game to create immersive, engaging learning experiences that motivate creative problem-solving
Expansive Learning (n=1)	Kurjenoja et al 2019	Transforming practices, multi-stakeholder collaboration and managing contradictions to create new solutions to complex problems
CDIO (Concevoir, Développer, Implémenter et Opérer) (n=1)	Nyka et al 2020	Integration of the entire project life cycle, iterative experimentation, research through design, interdisciplinary collaboration and the integration of contemporary technologies.

Table 1: Studio-Based Pedagogical Approaches: Modern Evolutions of Project-Based Learning (PBL)

ASTM (n=1)	Asefi et Imani (2018)	The development of critical and creative thinking through a structured and iterative design process, encouraging collaboration and interaction.
Project-Oriented Problem- Based Learning (PoPBL)	Wan et al 2012	Experiential and collaborative learning focused on problem-solving and student autonomy, applied to concrete projects embedded in the community

The dominant tendencies in architectural education for the 21st century are, mainly, characterized by:

#### 2.1 Moving From a Teacher-Centered to a Student-Centered Design Studio Pedagogy

This transition shifts responsibility for learning to the students, making the process more active, engaging, and meaningful(Abdelmonem 2014; Asefi et Imani 2018; Boudhraâ 2020). Delpire (2019), Breed et Mehrtens (2022) and Bregger (2017) highlight the positive impact of involving students in practical, real-life projects that are useful to society. Delpire (2019) describes the "Architecture Construite"<sup>7</sup> workshop as an example of "Pédagogie Ouverte",<sup>8</sup> an immersive experience "beyond the walls" of the design studio focusing on participation, cooperation, self-management and transparency. Breed et Mehrtens focus on "Live Projects", an Experiential Learning that provides a rich and stimulating learning environment, encouraging social empathy, flexibility and curiosity in design and collaboration with municipalities and professionals on urban green infrastructure (UGI). Bregger illustrate Problem-Based-Learning (PBL) describing an interdisciplinary project to design a sustainable community centre. This type of project immerses student in a real context and confronts them to concrete ill-defined problems fostering the development of problem-solving skills, interdisciplinary collaboration and a transformative learning. All these approaches, despite their challenges, allow students to develop different cross-disciplinary skills which encourage intrinsic motivation, a sense of achievement and sustainable learning. In this context, the Teacher and Student roles must evolve.

## **2.2 Moving From Vertical to Horizontal Interactions/Power Dynamics**

Horizontal interaction, the natural extension of Student-Centered Learning (SCL) transforms power dynamics within the design studio's pedagogy. By empowering students as active learners, we create a collaborative learning environment in real-life projects that fosters the development of critical thinking, creative thinking, communication, decision-making and team work skills. Boudhraâ (2020) illustrates this horizontal interaction through the co-design approach, as the driving force behind the co-evolution of the problem-solution space. This Approach involves the teacher as a facilitator and guide for collective reflection which encourages open communication and co-construction of ideas between him and the students and fosters empathy, flexibility, as students engage in meaningful problem-solving processes. Blanckaert et al. (2019) introduce the concept of 'transversal cooperation' in the context of a "Design & Build" educational project called "Garden of Experiences", promoting mutual learning where everyone is both "Teacher" and "Learner" in an embodied experience. This project encouraged the emergence of fluid, shared leadership illustrated by the roles of

<sup>&</sup>lt;sup>7</sup> "Architecture Construite" is the name of the workshop meaning "Built Architecture". (Delpire, 2019).

<sup>&</sup>lt;sup>8</sup> "Pédagogie ouverte" is the pedagogy used in the "Architecture Construite" workshop meaning "Open Pedagogy"(Delpire, 2019).

"Jexp'erts"<sup>9</sup>, "Jexp'ats"<sup>10</sup> and "Jexp'claves",<sup>11</sup> where everyone can play their part and contribute to the development of a common project.

The concept of horizontal interaction can be extended beyond the teacher-student relationship to encompass multi-stakeholder collaboration. Wan Mohamad et al. (2012) describe "Service Learning", a pedagogical model that encourages students to collaborate with the local community, as illustrated by the Kuching affordable housing project. Kurjenoja Lounassaari et al. (2019) present "Expansive Learning" as a pedagogical model that emphasises that a bottom-up approach relies on strong collaboration between students, teachers, professionals, and local communities to effectively navigate challenges together. Both teachers and students must engage with empathy to deeply understand local community concerns, while flexibility allows them to adapt their strategies to meet the unique needs of their territory.

A project carried out in Cholula, Mexico enabled the students to familiarize themselves with local realities, understand the needs of the population and grasp the importance of protecting intangible heritage. Immersion in this specific context provided the students with a rich and meaningful learning experience.

The teacher plays a central role in this process as a facilitator. He or she encourages the active participation of each stakeholder, stimulates exchanges, guides reflections and negotiations, and ensures that learning is sustainable and deep. In a more collaborative, democratic and dynamic learning environment, and to achieve truly transformative learning, it is becoming essential to adopt hybrid pedagogies, combining several approaches as it will be confirmed later on by our qualimetric analysis.

## 2.3 Towards Hybrid Design Studios-Based Pedagogical Approaches

The landscape of architecture and design education in the 21st century is in a state of flux. It has become essential to move beyond single pedagogical approaches and adopt more holistic and flexible ones. This literature review highlights the increasing use of diverse combinations of pedagogical approaches in design studios to address the growing need for disciplinary openness and community engagement.

Hybrid pedagogies in design studios combine varied methods to enhance architectural education. Abdelmonem (2014) emphasizes interactive, practice-based learning, where students act as "researcher-contributors" fostering engagement and active knowledge construction. Avsec and Jagiełło-Kowalczyk (2021) highlight conceptual thinking and self-directed learning as key to cultivating creativity, digital skills, and collaboration. Charalambous and Christou (2016) advocate for interdisciplinary, crisis-responsive studios that leverage innovative tools and cross-disciplinary approaches. Similarly, Design Studio

<sup>&</sup>lt;sup>9</sup> "Jexp'erts" refers to students who have previously participated in the "Garden of Experiments" project. The term blends "JExp'" with "experts" to highlight the experience these students have gained. With their prior involvement, they possess a deeper understanding of the project's approach and are able to mentor or guide new participants

<sup>&</sup>lt;sup>10</sup>"Jexp'ats": This term refers to new participants in the "Garden of Experiences" project. The pun combines "Jexp'" with "expatriates", emphasizing their recent arrival in the project. They are considered the future "Jexp'erts".

<sup>&</sup>lt;sup>11</sup>"Jexp'claves": This term refers to students benefiting from the organization set up by "Jexp'erts" and "Jexp'ats". The play on words combines "JExp'" with "claves", suggesting that these students hold the "keys" to effective action in the field without needing to consult the general coordinator.

Pedagogy: Horizons for the Future (2007) calls for adaptive studio models that integrate advancements in technology and address societal needs.

Hybrid studios promote disciplinary openness, preparing students to tackle complex global challenges through cross-field collaboration. They also encourage community engagement by incorporating real-world projects, involving stakeholders in the design process, and fostering socially responsible practices.

While these mostly combined approaches claim to foster cross-disciplinary skills, no empirical studies have measured their impact on integrating and developing the three "Design Thinking Traits" \_ empathy, collaboration and integrative thinking which allow to achieve a transformative sustainable learning (Breed et Mehrtens, 2022). This study, despite its limitations, could strengthen understanding the role of these pedagogical approaches combinations in integrating "Design Thinking Traits" and encourage more rigorous empirical studies which might provide insights for educators and researchers seeking to adapt pedagogical approaches to the changing multiform demands of the evolving architectural education.

# 3. Methodology

This study aims to measure the degree of integration of each "design thinking trait" into different pedagogical experiences to answer the following question:

- Which "Studio-based pedagogy" approaches best cultivate "Design Thinking Traits" in architectural education?<sup>12</sup>

In order to achieve this objective, rather than using precise queries, an exploratory/iterative research methodology, structured in three phases\_Searching, Screening and Evaluating\_was conducted to systematically select a relevant corpus guided by clear inclusion/exclusion criteria (Table 2 & 3). Additionally, a qualimetric evaluation<sup>13</sup> was conducted to assess how effectively each of the 28 case studies incorporated cross-disciplinary skills linked to "Design Thinking Traits", thereby ensuring a robust analysis of the pedagogical approaches.

## 3.1 Study Corpus

# 3.1.1 The Searching Phase (Titles, Keywords and Abstract Full Reading)

The searching was carried out both in English and French using Google Scholar Database and applying specific inclusion/exclusion criteria (Table2). This initial search aimed to identify relevant documents dealing with project based pedagogical approaches in design/architectural education in the 21 St century, in particular those that can be linked with "Design Thinking" and "Competency-Based Education".

<sup>&</sup>lt;sup>12</sup>The focus is not on evaluating whether these project-based pedagogies explicitly teach "Design Thinking" as a method, content, or pedagogical approach, but rather on examining the extent to which they foster a learning environment that promotes the acquisition of these three "Design Thinking Traits" decomposed on a set of 12 cross-disciplinary skills.

<sup>&</sup>lt;sup>13</sup>"Qualimetric Analysis" is a hybrid evaluation method that combines qualitative and quantitative approaches. In the context of our study, it is based on textual analysis (qualitative), and the use of a binary scoring system (quantitative). The combination of these two methods will enable us to identify correlations between pedagogical approaches and "Design Thinking Traits" in the design studio (Karavaeva et al., 2016).

The following keywords were used with different combinations: "Design Studio", "Design Pedagogy", "Design Learning", "Design Thinking", "Project-Based Pedagogy", "Competency", "Skills", "Design / Architecture/ Architectural Education", etc. We selected every document based on the title, keywords and full reading of the abstract. This enabled us to accumulate 200 relevant documents (peer reviewed articles, books and book chapters, conference papers, thesis, etc.).

Table 2: Inclusion and Exclusion Criteria Applied for The Searching Phase

General Inclusion/exclusion criteria	Description
1-Main theme	Articles on architectural/design education.
2-Language	The article must be in French or English.
3-Publication date	The article must be published between 2000 and 2022.

# **3.1.2 The Screening Phase (Full Text Reading)**

In the Screening phase, we focused on applying inclusion/exclusion criterion 4 to filter the documents further (Table 3):

Specific Inclusion/exclusion criterion	Description
4-Description of teaching experiences.	The article must mention the Teaching Context, Skills, Pedagogical Approach and Objectives, Learning and Assessment tools, Working Environment, Status of the teacher/student, etc.

# 3.1.3 The Evaluating Phase (Full Text Reading)

In the Evaluating phase, we focused on applying inclusion/exclusion criterion 5 to filter the documents further (Table 3). This systematic approach allowed for a rigorous selection of articles that directly addressed our research questions.

Table 4: Inclusion and Exclusion Criterion 5 Applied for the Evaluating Phase				
Inclusion/exclusion criterion	Description			
5-Link with "Design Thinking	The document should describe how the pedagogical activities facilitate the acquisition of a diverse range of			

cross-disciplinary skills.

. ... - . 

## **3.1.4 Reading and Annotation**

Traits"

All selected documents were read and annotated using Zotero software to extract the main themes and sub-themes addressed (Table 5) derived from Criterion 4 and 5:teaching context, competencies, pedagogical approach and objectives, learning and assessment tools, working environment, and the status of the teacher/student.

Table 5: Example of Extraction of Recurrent Data Collected From the Corpo	us
According to Inclusion/Exclusion Criteria 4 and 5	

Theme	Selected references	Context	Skills	Pedagogical Approach/ strategy	Teaching objectives and results	
Collaboration and Empathy and Integrative Thinking between the	Using "Live" Public Sector Projects in Design Teaching to Transform Urban Green Infrastructure in South Africa Christina Breed and Helge Mehrtens	Real-life design	Empathy Participation Communication Creative thinking1 Critical thinking Curiosity Flexibility Decision-making	Experiential and social learning Transformative learning Interdisciplinary Collaborative learning SDL	The results show that real-life confrontation with a project in a challenging environment provides learners with essential tools to become effective agents of change. Sense of competence achieved by students (Breed and Mehrtens 2022, 13,14,15)	
architecture and landscape departments and the local	South Africa		Negotiation Leadership Teamwork Problem solving		The local municipality is satisfied with the experience	
municipality	2017	Learning and assessment tools: study tour, technical workshop1, workshop, weekly critical session earning environment : social Dynamic, highly collaborative and interdisciplinary (internal/external) Recruitment strategy: voluntary participation Learning framework : Student-centered/active learner/teacher facilitator Design Thinking: explicit				

As a result of this exploratory/iterative research methodology, 26 documents (peer reviewed articles, books and book chapters, conference papers, thesis, etc.) encompassing 28 pedagogical experiences from over 20 universities across five continents (Figure 1) were selected for a qualimetric evaluation.



Figure 1: International Mapping of Scientific Document Selected on Studio-Based Pedagogy

## **3.2 Qualimetric Analysis**

This analysis utilized a textual inductive approach, drawing on the qualitative coding and categorization methods outlined by Strauss and Corbin (1998), to identify relevant cross-disciplinary skills embedded in each educational experiment. The main aim of this analysis is not to develop an immediate theory, but to identify the cross-disciplinary skills present in the educational experiences analysed, link them to "Design Thinking Traits" and quantify their impact.

## 3.2.1 Identification of Cross-Disciplinary Skills

Through textual analysis of the 28 case studies, 12 cross-disciplinary skills were identified then categorized under two main "Design Thinking Traits": collaboration (Communication, Participation, Teamwork, Leadership, Flexibility, Negotiation) and integrative thinking (Problem-solving, creative thinking, critical thinking, flexibility, curiosity and decision-making). This categorization was based on the alignment of each skill with the conceptual attributes of these traits as represented in the literature (Table 6) and inspired from the scientific article "Soft Skills in Design Education, Identification, classification, and relations" (Freitas etAlmedraa, 2021). Empathy was not decomposed into specific skills. due to its complex, subjective, and relational nature (Avsec et Kowalczyk, 2021).

UN ON	ins and reports r	Tom / Heinteetun	ar i edugogiear Experiences
Design Thinking Traits	Associated Cross- disciplinary skills	Textual analysis	Example
Collaboration	Communication Participation, Teamwork, Leadership, Flexibility Negotiation	1- Textual markers: - Cross- disciplinary skills -Design thinking Traits 2- Narrative structure	-"I might not have learnt exactly what Tec wanted me to, but I learnt how to think, challenge, collaborate, listen I am a better person <sup>14,15</sup> -"For the students, the project created rich social dynamics and an interplay of familiarity and uncertainty, which aided transformative learning. The students'
Empathy	Explicit citation	analysis: - Description of	deeper learning indicates greater social empathy, reconsidering the role of the
Integrative Thinking	Problem-solving Creative thinking Critical thinking, Flexibility Curiosity Decision-making.	the learning process. -Examples and testimonials <b>3-project impact</b> <b>assessment:</b> -Concrete results (Changes in student behaviour or perceptions) -Skills development as an outcome	profession, greater design process flexibility, and learning and valuing skills across disciplines." <sup>16</sup> –"La résolution des problèmes s'est opérée directement in-situ, []. Plus de 85 % des étudiants ont trouvé les échanges bons à très bons au sein des groupes.", " Agir puis réfléchir, c'est se poser les questions[]sur les raisons de son action", "Observer: Jexp'rime, jexp'lore, jexp'érimente sont autant de termes qui traduisent [] une relation sensible à l'être et à l'espace qui l'entoure." <sup>17</sup>

Table 6: Manifestation of Design Thinking Traits Through Associated Cross-Disciplinary
Skills and Reports From Architectural Pedagogical Experiences

#### 3.2.2 Binary Scoring System

- The presence of the 12 cross-disciplinary skills was quantified by assigning a score of one (1) when it is possible to state with certainty that the skill is being targeted and developed,

<sup>&</sup>lt;sup>14</sup>This statement suggests learning that goes beyond technical skills. The student has developed human qualities and cognitive, meta-cognitive, interpersonal and social skills which are essential in a social context of learning (Acuña et al., 2017; Blanckaert et al., 2019; Breed et Mehrtens, 2022)

<sup>&</sup>lt;sup>15</sup>Quote from a Play Lab student (Acuna et al, 2017, p6.)

<sup>&</sup>lt;sup>16</sup>Breed et Mehrtens, 2022, p. 1.

<sup>&</sup>lt;sup>17</sup>(Blanckaert, 2019)

within the context of the experiment, whether explicitly or implicitly.<sup>18</sup> while *a score of zero* (0) was attributed when the text provided no indication of the development of the skill. The attribution of a score (1) for *empathy* was based on the authors explicit statements of its integration.

- The degree of integration for each trait was calculated by summing the scores for all associated cross-disciplinary skills. This binary system provides a clear, concise, and objective assessment, facilitating comparisons across the 28 educational experiences.

The **Binary scoring system** used in this study provides an initial overview of the integration of "Design Thinking Traits" into different educational experiences. It makes it possible to compare approaches and identify those that seem most promising. However, it presents several limitations, notably publication bias, as authors tend to emphasize the positive outcomes of their research. As a result, there is a pressing need for further *in-depth empirical studies "in situ"*, including longitudinal data and more refined evaluation methods, to *fully assess the validity and reliability of the results*. For a more complete assessment of the impact of teaching approaches on skills development, it is necessary to combine more precise evaluation methods, qualitative observations and longitudinal studies that allow the evolution of skills to be tracked over several years.

#### 4. Results, Discussion and Implications

## 4.1 Identification of Overlooked and Highly Valued Cross-Disciplinary Skills

Through an in-depth textual analysis of the international case studies, we identified 12 distinct cross-disciplinary competencies that are cultivated through studio-based pedagogies. The results show that while skills such as communication (28/28), creative thinking, and problem-solving (26/28) are emphasized, others, such as empathy, curiosity, negotiation (12/28), and shared leadership (11/28), are often overlooked.

While curiosity, empathy, negotiation, and shared leadership are recognized as crucial transversal skills for enriching architectural design practices (Freitas & Almendra, 2021), their integration into pedagogical practices remains limited, highlighting a significant disparity between their theoretical importance and practical implementation. Among the 28 case studies analysed, only 12 explicitly addressed curiosity, empathy, and negotiation, while shared leadership was addressed in just 11. This gap can be attributed to several challenges, including the traditional dominance of technical knowledge in design curricula (Asefi & Imani, 2018; Avsec & Jagiełło-Kowalczyk, 2021; Holubchak, 2020), a lack of resources and time for integrating empathy, curiosity, negotiation, and/or shared leadership-focused activities, and the absence of reliable methods to assess them as a measurable outcome (Aydemir, 2017). A rigid hierarchical culture (Charalambous et Christou, 2016), where the teacher is the sole authority figure, often undermines opportunities for shared leadership and collaboration. Furthermore, the emphasis on teacher validation may discourage risk-taking and experimentation—critical components of curiosity and empathy. The lack of adequate teacher training on how to effectively teach these transversal skills presents another significant barrier, compounded by the absence of reliable tools and resources to assess these competencies, which further hinders their inclusion in the curriculum.

<sup>&</sup>lt;sup>18</sup>The skill is not named directly, but its development can be deduced from the learning context, the activities described or the results obtained via a rigorous textual analysis as described in 3.2.1 Identification of Cross-Disciplinary Skills.



Graph 1: Assessing Variation in the Prioritization of a Repository of 12 Competencies Across 28 Pedagogical Case Studies

#### 4.2 Unveiling the Most Effective Pedagogical Combinations

Our analysis also sought to identify the most *promising pedagogical combinations* that support a balanced development of the key "Design Thinking traits" (Graph 2 & Table 7):

- University of Pretoria's Experience No. 13: This approach, which ranks first in effectiveness, integrates *critical pedagogy, live projects* (framed as experiential and social learning), and *transformative learning*. This combination fosters a comprehensive learning environment that promotes both social engagement and critical reflection. Critical pedagogy encourages students to question societal norms and power dynamics, while real-world projects immerse them in enhance practical and relational skills. Transformative learning deepens their values and perspectives, encouraging a commitment to sustainability and equity.

- University of Montreal and University of Malaysia's Experiences No. 09 and No. 23: Ranking second, these cases employ a *hybrid pedagogical approach*. Experience No. 09 from the University of Montreal combines *co-design, learning-by-doing*, and *design thinking*, creating an interactive framework that emphasizes practical engagement and collaborative creativity. Experience No. 23 from the University of Malaysia utilizes *student-centered learning, service learning, and project-oriented problem-based learning* (PoPBL), focusing on student autonomy and community-centred problem solving.



Graph 2: Representation of the "Design thinking Trait" Degree of Integration (in%) in the 28 International Cases Studies

Table 7: Degree of Integration of Design Thinking Traits in the 3 most Promising						
Pedagogical Experiences						

	Art /N°	Author(s)	Source Yes		Relevance to Design Thinking Traits		
				Year	Collaboration	Empathy	Integrative Thinking
	9	(Boudhraâ 2020)	PhD thesis University of Montreal	2020	33,33 %	33,33 %	27,78 %
	13	(Breed et Mehrtens 2022)	Land journal's	2021	33,33 %	33,33 %	33,33 %
	23	(Wan Mohamad et al. 2012)	Malaysian Architectural Education Conference (MAEC 2012)	2012	27,78 %	33,33 %	33,33 %

#### 4.3 Discussion and Implications of the Results

Although distinct in their implementation, the pedagogical experiences from Pretoria, Montreal, Malaysia, and many other cases converge around a common educational philosophy (Figure 2): experiential learning, a combination of pedagogical approaches, and "Design Thinking" as a mind set.



Figure 2: Framework of Holistic Pedagogy for Architectural Education

## 4.3.1 Experiential Learning: The Core of Studio-Based Pedagogy

The importance of "learning by doing" as a foundation of studio pedagogy is widely recognized, enabling students to apply theoretical knowledge to concrete projects and build a deeper understanding of real-world challenges. Christina Breed and Helge Mehrtens (2022) emphasize the transformative power of real-life projects for postgraduate design students, noting that:

"The real-world conditions of live projects foster experiential learning that could be deep and transformative." (Breed et Mehrtens, 2022, p. 3)

This approach aids students in adapting to dynamic urban environments while bridging the gap between theory and practice.

Students, having taken part in the study cases, frequently cited the "real-life nature" of projects as impacting their creativity by introducing actual constraints that required innovative responses. Furthermore, interdisciplinary and socially engaged components such as community feedback, on-site visits, and guidance from municipal representatives fostered rich, hands-on learning experiences (Breed & Mehrtens, 2022, p. 14). These real-world encounters, as Breed and Mehrtens note, helped students link their solutions more closely to community needs, illustrating how experiential learning cultivates empathy and integrative thinking by connecting students to the human context of their designs.

Blanckaert et al (2019) highlight collaborative learning as a key element of experiential learning, particularly in the context of real projects. Their research is based on the principle of "Design and Build", where students, working in groups, confront their ideas with the reality of the field. This process of co-design and co-creation encourages adaptation, exchange and discussion, leading to the appropriation of know-how. Emphasis is placed on the role of the "teacher" as a guide rather than a transmitter of knowledge.

Experiential learning (EL) is a dynamic process that engages learners in constant interaction with their social and physical environment, fostering a deep, embodied understanding of the world.

## 4.3.2 Design Thinking as a Mindset

"Design Thinking" is often misconceived as a simple, reproducible, problem-solving methodology. However, it is first and foremost a state of mind, a way of thinking and approaching problems. It is a complex (Ghonim, 2016; Avsec & Jagiełło-Kowalczyk, 2021), iterative process (Boudhraâ, 2020; Dorst & Cross, 2001) based on constant interaction between thought and action, enabling designers to refine their ideas and test them in real-life conditions. "Design Thinking" is more than the mechanical application of a series of predefined steps. It implies deep reflection, openness to experimentation and the ability to adapt to complex and changing situations.

## **4.3.3 A combination of Pedagogical Approaches**

This distinction between mindset and methodology becomes particularly relevant when considering how "Design Thinking" is taught. The results of this study emphasize the limitations of a single, linear pedagogical approach, which, when focused solely on technical

and scientific aspects, reduces "Design Thinking" to a simplistic problem-solving tool. This reductive approach overlooks the human and social dimensions of design, thus hindering the development of essential cross-disciplinary skills like empathy and limiting the growth of interpersonal and social competencies. Todoroff et al. (2021) show that civil engineers, by focusing on specific technical objectives, often neglect the human and social dimensions of design, unlike architects who adopt a more holistic approach.

The University of Pretoria's approach illustrates the benefits of a pedagogical combination integrating critical pedagogy, real-life projects and transformative learning. Ranked among the most promising for the acquisition of "Design Thinking Traits", this approach promotes:

- (a) **Deconstructing Norms and Power Structures:** Critical pedagogy encourage students to analyse existing systems, highlight embodied injustices and inequalities, and consider alternative solutions.
- (b) **The development of Practical and Relational Skills:** Real-life projects confront students with the concrete challenges of the professional world, enabling them to apply theory to practice. They develop problem-solving, communication and collaboration skills, while understanding the constraints and opportunities of the real-life context.
- (c) **Commitment to Deep Values**: Transformative learning aims for a profound shift in values and perspectives. By exposing students to social and environmental realities, it fosters a commitment to sustainability and equity.

#### 5. Limitations of the Study

**Publication Bias:** The corpus studied could be biased by the tendency to privilege positive results, thus underestimating the challenges encountered in implementing pedagogical approaches.

**Binary Scoring System:** The use of a binary scoring system to assess empathy, while offering an initial comparative approach, fails to capture the subjective, relational and contextual nature of this trait. More refined and qualitative assessment (in-site qualitative observations) methods are essential to better understand the development of empathy in architecture students and the impact of pedagogical approaches on this development.

**Lack of Longitudinal Analysis**: The study does not assess the long-term effects (progress trough the five year curriculum) of pedagogical approaches on students' progression, due to the fact that this type of analysis was conducted in only a few of the studied cases.



Figure 3: Empathy at the Heart of a Holistic Approach to Teaching Architecture

#### 5. Conclusion and Recommendations

In this study we adopted a combined deductive and inductive approach to investigate the impact of pedagogical methods on the development of "Design Thinking Traits" in architectural education. Grounded in the theoretical framework of "Design Thinking Traits" (Brown, 2008; Blizzard et al., 2015), we analysed 28 international case studies to evaluate whether empirical observations aligned with this framework. Through a rigorous literature review and a textual analysis, we identified 14 new variations in the evolution of Project-Based Learning (PjBL) (Table 1) and 12 cross-disciplinary skills that are critical to the cultivation of these traits (Figure 3).

The findings highlighted the transformative potential of embodied experiential learning and hybrid pedagogical approaches in fostering a "Design Thinking" mindset. Certain pedagogical combinations—such as the South-African case study (N°13), which integrates critical pedagogy, real-life projects, and transformative learning—stood out as particularly effective in nurturing collaboration, empathy, and integrative thinking, essential competencies for 21st-century architectural education.

Studio-Based Pedagogy, at its core, bridges theory and practice through immersive, realworld projects. These experiences challenge students to navigate professional constraints and opportunities, honing both practical and interpersonal skills. By encouraging dynamic engagement with local communities, these projects foster empathy, collaboration, and integrative thinking, anchoring design processes in a richer, more human context.

Nevertheless, this study underscores the need to reconceptualize "Design Thinking" not as a rigid, linear methodology but as a flexible, reflective mindset. A purely technical or procedural interpretation risks reducing design thinking to a mechanistic tool, stripping it of its profound human and social dimensions. Instead, embracing a mindset rooted in critical reflection and adaptability—supported by hybrid and experiential pedagogies—can cultivate learning environments where students not only acquire skills but grow into empathetic, reflective, and innovative thinkers.

The holistic pedagogical framework proposed (illustrated in Figure 2) rests on three interconnected pillars: *Experiential Learning, Design Thinking as a mindset,* and *the integration of Diverse Pedagogical Approaches.* Together, these pillars enable the cultivation of empathy as a vital link between collaboration and integrative thinking, as well as between cognitive/meta-cognitive and interpersonal/social dimensions.

To prepare students for the multifaceted challenges of architectural practice, this study advocates for curriculum strategies that include:

- **Student-Cantered Learning:** Empowering students to take ownership of their learning process.
- **Combination of Diverse Complementary Pedagogical Approaches:** Integrating various methods to create resilient and dynamic learning ecosystems.
- Horizontal Power Dynamics: Encouraging educators to act as facilitators, fostering collaborative, cross-disciplinary, and participatory experiences.
- **Experiential Learning Opportunities:** Prioritizing "Design & Build" and "Live Projects" to ground education in tangible, real-world contexts.
- **Reflective and Critical Thinking:** Instilling a habit of self-assessment and fostering the ability to critically evaluate design processes through social, cultural, and ethical lenses, enabling students to become agents of meaningful societal change.

Architectural education transcends technical skill acquisition; it is a transformative journey that shapes students' world-views, values, and approaches to design. Drawing from the philosophies of John Dewey and Tim Ingold, this process of experiential learning becomes a holistic practice—engaging the whole individual and fostering a deeper understanding of self, society, and the environment.

In conclusion, "Design Thinking" lies at the heart of this educational transformation—not as a linear methodology but as an *embodied, intellectual practice*. It emerges through the interplay of body and mind, the engagement with social and physical contexts, and on-going reflection that enhances understanding of both self and society. By adopting this vision, architectural education can prepare students to design not just with skill, but with profound purpose and responsibility, empowering them to create meaningful, lasting impacts on the world.

# 6. Opening for Scientific Debate

During the BCE 2024, a rich discussion and a personal critical reflection on architectural education emerged around the themes of Experiential Learning, "Design Thinking" and pedagogical experiences. While this study provides valuable insights, it raises questions that deserve further exploration.

How can we design educational paths that promote a profound transformation of the individual, engaging them holistically (body, mind and emotions), and leading them to a heightened awareness of themselves, their values, and their role in society?

Given the integral role of empathy in socially responsible design, how can we measure empathy effectively in students and practitioners, especially considering its complex, multidimensional nature? How can learning design support this transformative process by encouraging both introspection and concrete engagement with the real world?

How can "Design Thinking", as an embodied intellectual practice, help students translate their reflections into responsible actions and address contemporary challenges?

What is the role of educators in this process? How can we train and equip them to become mentors capable of guiding students in their personal exploration and the development of an ethical practice?

How can we foster the creation of a cross disciplinary community of learning within architecture schools, encouraging peer exchanges, collaborations, and collective knowledge building?

Finally, how can we evaluate the long-term impact of these pedagogical approaches on architects' professional practice and their social engagement? What research methods would allow us to measure the influence of these approaches on how architects tackle contemporary challenges and their societal responsibilities?

These questions underscore the importance of on-going research and collaboration in redefining architectural education to address the complexities of contemporary practice and societal needs.

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### Audiovisual Minga! Co-creating Community Stories While Building Intercultural Partnerships in Higher Education

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#### The Barcelona Conference on Education 2024 Official Conference Proceedings

#### Abstract

In 2016 the authors designed an educational interaction for U.S. college students (Northeastern University, Boston, MA USA) and Kichwa indigenous media makers (Otavalo, Ecuador) to support community initiatives while opening students to different cultural frameworks and ways of being. Three iterations of this course (2016, 2017 and 2023) initiated our experiments in intercultural media co-creation in higher education. Our adaptive and responsive curriculum reaches across cultural, geographic, and socio-political borders to explore a more just and equitable media ecosystem. The methodologies are based on the Kichwa values of minga and ranti ranti (shared work and reciprocity). These Kichwa structures guide pre-production, story development, film production, film screenings, and the collaborative partnerships with nature and community. Through this indigenous led, indigenous centered engagement students begin to recognize and question individual values underpinning western viewpoints rooting their contribution from their distinct cultural position while interrogating it. By co-creating community stories from an indigenous perspective, we build curricula that strengthen intercultural partnerships, changing how we think and design for the future.

Keywords: Narrative Sovereignty, Indigenous Self-Representation, Reciprocity, Co-creation, Higher Education, Teaching

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#### Introduction

A "pluriverse" is a world within which many worlds fit. The Zapatistas popularized this term through their land struggles in Chiapas (Escobar, 2018, p. 68). By contrast, a One World World (OWW) Western paradigm is commonly reinforced in academic institutions in the United States (Escobar, 2018, p. 66). To challenge this paradigm, we designed a course that brought together university students from Northeastern University in Boston, Massachusetts, USA, and members of the Association of Audiovisual Producers Kichwas (APAK) in Otavalo, Ecuador. We built co-learning partnerships between Northeastern, APAK, and Kichwa communities, co-creating audiovisual materials to strengthen community initiatives while exposing Northeastern participants to different ways of thinking and being.

## About Us

Samia Maldonado is a Kichwa Otavalo woman born in Imbabura and a founding member of the Asociación de Productores Audiovisuales Kichwa (APAK). David Tamés, the son of Cuban immigrants, grew up in Florida and is now a media maker teaching in Boston, Massachusetts. Cristina Herdoíza, an APAK producer, was born in Quito and raised in a Western household. Throughout her life, she has immersed herself in Kichwa communities, which have radically influenced her life choices and thinking. Jean Schmitt, who came from a middle-class academic upbringing in the United States, raised her son in a bilingual/bicultural household spanning two continents—incorporating English and Spanish languages, and U.S. white and Ecuadorian mestizo middle-class cultures. She currently teaches and maintains an artist studio at the University of Arkansas.

Together with students, we practice *Minga Audiovisual*, APAK's method of community audiovisual production adapted from the traditional Kichwa minga—shared work for the benefit of all. As we engage in minga—writing, teaching, making videos, and entering community spaces—we recognize how our distinct worldviews influence our participation in shared work.

## Kichwa Self-Representation in the Media

Audiovisual production is not traditional to the Kichwa-Otavalo, a people with a rich oral tradition. Community distrust of photography and filmmaking developed over a century as Western-extracted images either romanticized or degraded Kichwa people, with no economic or cultural returns to their communities. This history led to both widespread rejection of being portrayed or recorded and disinterest in learning media-making processes.

## Minga Audiovisual: Adapting Minga to Mediamaking

In contrast, minga is very familiar. Kichwa mingas extend back as far as memory allows, centered on Ayllu kinship relationships based on common origins and territories. In Kichwa communities, minga, the shared work, occurs daily in construction, planting, harvesting, organizing festivities, and as a response to solving anything that the community or its members need.

APAK's Edison Muenala describes their approach to community filmmaking: "We were searching for a way of doing and teaching. From conventional filmmaking knowledge it was not possible. So we thought: what if we are guided by our own ways of doing things, what is common for everyone, so that everyone understands what it is about? This thought led us to break with established media-making processes. So we keep doing minga and more minga. Through these forms, we practice culture, strengthen bonds, and self-represent the vitality and value of the Kichwa Native Peoples."

In 2009, APAK launched the television program *Bajo un Mismo Sol (Under the Same Sun)*, featuring the Peoples and Nationalities of Northern Ecuador in alliance with audiovisual producers from various Indigenous nationalities of the coast and Ecuadorian Amazon. For over 15 years, the program has documented crucial aspects of Indigenous life and knowledge, including *Sumak Kawsay* (good living), territorial defense, language revitalization, traditional crafts, ancestral stories, and Andean music. The broader initiative includes programming that actively works to challenge social prejudices about Indigenous language, food, cultural practices, and education, while preserving traditional knowledge like ancestral medicine and midwifery practices. Through this programming, APAK claims the right to audiovisual communication with self-representation of their own narratives in ancestral languages. Due to the program's longevity, a new generation of Kichwa media makers has grown up watching it.

## Welcoming Western Participants

In welcoming Western participants into the minga, *los mingueros* (minga participants) experience both balances and imbalances in our distinct ways of thinking and being. This occurs through what we could call "ruptures"—when fixed borders or differences dissolve into a shared relational space, leading to openness and receptivity. We all feel the tensions that lead us to interrogate Western worldviews.

In 2016, we planned the first *Latitude 0* course for Northeastern University. The main goal was to expose students to ways of thinking and being very different from their own in a transformational way while supporting community initiatives through audiovisual production. This early APAK/Northeastern partnership allowed us to design encounters where participants could share non-hierarchical spaces, where cultural, geographic, socio-political, and economic borders could be explored as territories of encounter rather than divisions. Through multiple iterations of the course (2016, 2017, & 2023), we are learning that built into the age-old cultural practice of minga and, by extension, *Minga Audiovisual*, we find adaptive, responsive, immersive, and non-hierarchical educational and filmmaking methods that can lead the way in transforming both higher education curriculum design and Indigenous community filmmaking methods.

In minga, participants recognize each other as equals. Throughout the process, everyone is under everyone's gaze, approving and failing, mutually sharing knowledge and experience. *Minga Audiovisual* is concrete and relational: it produces an audiovisual product while also building important relationships between all participants—Community (family), Community, University, and APAK. These relationships aren't accidental—they're carefully cultivated by all parties, with APAK's family-based (ayllu) structure helping to establish genuine connections with communities and other participants.

## Film Example: Rituales de Agua Warmi Razu Mama

One example film from 2023 is titled "*Rituales de Agua Warmi Razu Mama*" ("*The Water Rituals of Warmi Razu Mama*"). In this film, the Kichwa community of Tunibamba shares

their sacred water ritual with non-Kichwa participants to highlight the importance of their sacred land and to welcome tourists to participate in the ritual. In the film, two Northeastern students join two Tunibamba elders for the ritual and then encourage others to take part. This film was produced through audiovisual minga and embodies many of the strengths of the process. As we discuss the stages of minga, we'll describe stills from the film that highlight each stage. The 4-minute, 9-second film can be viewed in its entirety here: https://drive.google.com/file/d/1Af7q3v2XjA-jgRvS- z-2X4Zo42ZQWxx/view?usp=sharing

#### Stages

For a process to be considered minga, all stages must be completed to everyone's satisfaction. If any stages are skipped, it is not considered minga. Below, we describe the stages, highlighting audiovisual and intercultural dynamics. We begin with the final stage and then proceed in chronological order.

#### Watapa Tuparishun.

*Watapa Tuparishun* is the reflection stage of minga. Through various feedback formats including group reflection and sharing, feedback meetings, and written reflection—relational and technical aspects of the process emerge that may have gone unnoticed. Experiences, observations, and sensations are recorded, and technical and logistical notes serve to improve the next *Minga Audiovisual*.

In our projects, feedback sessions occurred between the university and APAK; students, community, APAK, and teachers; field producers, APAK, and teachers; and within APAK internally. In 2023, we paid special attention to group cohesion and teamwork. We recognized the importance of community producers and communities. One behind-the-scenes group visited all communities but did not establish a relationship with any single representative, community, or place. This group showed the least cohesion, which impacted their experience and understanding of minga. We also found that groups that maintained clear roles while remaining flexible built the strongest camaraderie and trust. This minga-inspired flexibility provides an alternative to competitive structures in higher education.

## Tandanakushun.

*Tandanakushun* means "Let's unite! Let's organize!" This call triggers community action with a clear purpose. Because minga is an ancient tradition, this call is not thought, but felt. This stage is about welcoming. In our *Minga Audiovisual*, the welcoming stage began on the first day in Otavalo. This meeting took place in the APAK studios with community producers and families, APAK, and Northeastern participants. APAK welcomed students, community members, and teachers. We became *mingueros* (minga participants), sharing experiences and expectations for the minga. Intercultural *Tandanakushun* is about considering how worldviews influence each person's engagement with the process. As each participant shares, we all feel welcome.

The opening scene of "*Rituales de Agua Warmi Razu Mama*" features a Tunibamba community member offering a welcoming message. The subtitle reads: "Greetings to all who watch this video, you are cordially invited to get to know the Tunibamba Community." This shot serves as an invitation for all viewers to learn about the sacred water ritual and the community (Figure 1).

### Wankurishun.

*Wankurishun* is the call for collective unity and the stage where all *mingueros* commit to community work, providing ideas and technical knowledge to achieve goals. In *wankurishun*, community producers introduce their community through photos, videos, maps, and other materials. We learn about the community's connections to territory, ideas, knowledge, history, memory, and needs for the audiovisual product. This is when the collective fabric begins to find its shape, enabling forward movement.

Groups form, including teams of four students, a community producer, a technical producer, an APAK facilitator, and when possible, a translator. Ideas begin to emerge. A structure develops as the team reveals their skills, which are matched with the community producer's vision. *Minga* values knowledge from both thinking and *senti/pensar* (feel/thinking)— knowledge born from the combination of thinking and feeling. Rather than fostering competition, *mingas* thrive on the mutual recognition and validation of each person's talents, skills, strengths, limitations, and character. For video production, this phase results in co-produced pre-production documents that structure the community production day.

In the film, the *wankurishun* extends to a unity and commitment to nature central to community beliefs. Several scenes strengthen the connection with, and commitment to, the land and traditions of Tunibamba. The title frame features blue text, *"Rituales de Agua Warmi Razu Mama*," against a backdrop of snow-capped Cotacachi, the sacred mountain, centering the importance of territory to the community (Figure 2). Another scene shows a sweeping view of the Andean landscape with the two elders and students walking along a hillside path. (Figure 3.) Draped in clouds, the mountains and valley below provide context for the film's setting. Along the path, one of the elders stops to gather medicinal plants. The elder pauses among yellow wildflowers. He speaks in Kichwa with the subtitle: "Mama Razu, I ask your permission to collect these plants since I need them to heal myself as well as my family" (Figure 4). The presence of the community at every stage, ensures that scenes will reinforce connections to nature and territory.

## Uchay Uchay.

*Uchay Uchay* translates to "little-by-little, step-by-step, together." This phase includes the production day inside the community. During this phase, we photograph and record video and sound according to the plan. Many relational aspects also come to the forefront. The community producers open their community for the first time. As they welcome university students, there is uncertainty about how they will perceive the differences they encounter. Community producer Susana Oyagata noticed how Western participants' individual perspectives are greatly challenged when they first enter the communities. She speaks about the moment when everything begins to flow: "*Hay que solidarizarles*!" ("We have to bring them into a state of solidarity") (Susana Oyagata, personal communication, June 2, 2023). This happens in the down times as community time unfolds—accompanied by small rituals, silences, listening to others and the territory, carrying equipment, helping each other, snacking, warming up, dancing, and embracing the unexpected. Even language barriers diminish during bus ride conversations, bouncing in the back of a pickup, or everyone eating with their hands at a *pampa mikui* (outdoor communal meal during filming).

During any *minga* stage, roles may change. Nothing is rigid. While defined roles are important, they can vary. The *minga* goal is concrete and holistic. Roles shift to best meet the

common goal. *Mingueros* show initiative, commitment, and fluidity while a common will prevails and decision-making responds to the common objective. A *minguero* assigned to camera may also end up recording sound. This flexible structure removes hierarchies, and competition dissipates. Everything flows!

Entering the communities for the first time brings forth ruptures. For most Kichwas, opening their territory to others is sacred and includes reciprocity with the space and the community that welcomes us. Physical permissions are granted by territory and community leaders. Spiritual permissions come from the territory itself and everything that lives in it. The latter requires opening for Western participants and provides an opportunity for examination. By entering the community in this way, all activities become fluid and without problems.

In the community, on production day, experience is the greatest teacher. A scene from *"Rituales de Agua Warmi Razu Mama,"* shows a close-up shot of bare feet walking on muddy ground scattered with yellow leaves (Figure 5). Walking barefoot on the muddy path emphasizes the direct connection between people and earth during the ritual. Removing one's shoes when entering the sacred space is a sign of respect and a way to connect directly with the earth. For one Northeastern student participating in the water ritual, the transformative moment came when they learned they needed to remove their shoes. They realized that their job was to absorb, and when they felt the mud beneath their feet, they knew this experience would be spiritual, but not comfortable (Student interview, June 6, 2023).

## Chapashun

*Chapashun* means "let's review, let's evaluate, let's see how it goes." This stage launches the post-production filmmaking phase and begins with reflection on the community production day. Community producers and students reflect upon and share how it felt, what they learned, what they would change, one phrase to describe their experience, an incredible image, and whether they met their objectives for production. After sharing impressions, the editing phase begins. Students distribute footage and begin putting scenes together. The scenes are shared among the group, with the community producer's input critical to ensuring the community's self-representation. In the editing phase, the community producer represents the community's perspective and voice.

During the previous *minga* stages, group bonds are strengthened through strong community relationships. This growing empathy shapes design decisions throughout. Community-centered design decisions ensure self-representation, including attention to the importance of color, symbols, sounds, and music. There are many "have-to's" that become clear. In the title scene of "*Rituales de Agua Warmi Razu Mama*," the mountain represents the essential connection to territory while the sound design includes the sounds of the sacred waterfall mixed with the deep, resonant blow of the *churro*, the conch shell horn that serves as both music and a welcoming call. All three elements needed to be present to open the film in a way that centered the community producer de-emphasizes the sense of a big evaluative moment so common in higher education. Instead, we are reminded that throughout minga, all *mingueros* are under everyone's gaze, approving and failing, sharing knowledge and experience so all *mingueros* bring forth their best efforts toward the highest quality common goal for the common good.

#### Imakuanta Rikushun.

In *Imakuanta Rikushin*, we hold a community screening and celebration. Communities come together to share food, reflections, and learning. In this stage, video, audio, photography, and graphic design files obtained during the *minga* are returned to the community. The documented wisdom, practices, and traditions go back to their source—the community itself. Returning knowledge to the community is the ultimate closure.

Representatives from students, community producers, APAK, and communities share their impressions and experiences of working together. Community members give *medianos* (gifts for students, teachers, and APAK). These are foods considered valuable, usually fruits and grains, as well as handmade crafts like bracelets for each *minguero*.

*Mingueros* also celebrate with music and dance. This vibrant moment was captured through spontaneous video documentation. In the video, APAK technical producer Edison Muenala leads the *mingueros* in a circular dance. The sequence shows a crowded indoor space with participants arranged in a circle, following traditional Kichwa dance movements. Community members dance with Northeastern students and teachers, reflecting the intercultural nature of our work together. The joyful atmosphere is evident in the hearty laughter visible in several frames. Someone in the background documents the moment with a phone held high, while others are fully immersed in the dance. The act of dancing in a circle while stamping feet is traditionally connected to "waking the earth" through rhythmic movements. This moment embodies intercultural *Minga Audiovisual*, dissolving borders into shared relational spaces where the shared work and reciprocity lead to new bonds based on openness and receptivity.

As the credits roll, the closing scene of "*Rituales de Agua Warmi Razu Mama*" shows another moment of spontaneous dance emerging. The scene captures people dancing in a circle on a muddy road, with misty mountains in the background (Figure 6). This wasn't a planned shot but emerged organically, and everyone danced. Students described being barefoot, wet, tired, and hungry after the production day. But when the elder, Taita Rafael declared that *minga* ends with dance, they thought, "We're going to dance, this is how we do it." The students' realization that "co-creation was happening" right there, with sound equipment still rolling, and another's epiphany that "it's not about me, it's about the spirituality of the group" describes the moment when exhaustion and discomfort gave way to communal spirit and collective practice.

## Conclusion

## Minga Audiovisual and the IAFOR Experience, Reflections by Jean Schmitt

I come from the middle of the United States which, by some measures, may be considered the belly of the beast. I'm thinking about Baden Offord's analogy, where we cross the river (of our overlapping contemporary crises) through established ways over the bridge and by responsive/collective ways using a raft (Baden Offord, 2024). I'm also thinking about Yirga Voldeyes' call to participate in different learning structures (Yirga Gelaw Woldeyes, 2024). I hope our work with intercultural *Minga Audiovisual* might explore what building a common raft and experimenting with alternative learning structures might look like.

I'm an artist teaching at the epicenter of Western One World World thinking, where the concept of nature and human relationships involves separation, invisibility, and reinforcement

of hierarchies. I don't just want to help my art and design students get off the bridge; I'm very interested in building rafts to cross together at the river's rhythm.

In our *Minga Audiovisual* project, it might look like this: We'll celebrate our exit from the bridge as a prefabricated path. I'll meet with our Kichwa collaborators and think about how to design the most incredible raft possible... And immediately they might say, "Well... have you considered? Here the river moves very differently. Can you feel how the current changes? Faster, then slower. Can you see how the river will change depending on how we relate to it? Let's listen to everyone, especially those closest to this stretch of the river." Big Western ideas might lead to shipwreck; knowledge of the river implies memory, experience, and wisdom that comes from lived and shared relationships. Perhaps we might integrate with the river while crossing it. This way is very different from the commonly followed one.

The call to participate in intercultural *Minga Audiovisual* opens the possibility of living a unique experience, trusting the river and the people closest to it, regardless of how tumultuous the waters may be.



Figure 1: Film Still From Rituales de Agua Warmi Razu Mama



Figure 2: Film Still From Rituales de Agua Warmi Razu Mama


Figure 3: Film Still From *Rituales de Agua Warmi Razu Mama*. Tayta Rafaél Pérez, community producer.



Figure 4: Film Still From *Rituales de Agua Warmi Razu Mama*. Tayta Rafael Panamá, ceremonialist.



Figure 5: Film Still From Rituales de Agua Warmi Razu Mama



Figure 6: Still From Documentation Video of the Imakuanta Rikushun



Figure 7: Film Still From Rituales de Agua Warmi Razu Mama

#### Declaration of Generative AI and AI Assisted Technologies in the Writing Process

Claude.ai was used as a translating aid as the authors wrote collaboratively in both English and Spanish. Claude.ai also assisted with the basis for some image descriptions, as well as improving language to remove redundancies and create a better flow.

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# Examining Teacher Trainees' Use of Digital Tools From the Perspective of Learning and Teaching

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#### Abstract

The Teacher Training Institutes have a decisive role in training teacher candidates with an adequate level of digital competence, who can use the methods and techniques that help students develop their skills and abilities in order to acquire professional knowledge, creating their chances for active employment on the labor market. In our presentation we present the results of the second phase of a longitudinal study. The survey was launched in the academic year 2022/23 with the aim of examining whether first-year students entering teacher training have the level of digital competence necessary to be able to use digital learning materials effectively and professionally as future teachers and to develop the digital literacy of their students. In the first phase, a questionnaire was developed to measure the level of competence, based on the examples provided in the DigCompEdu and DigComp 2.1 frameworks for the development and interpretation of digital competence. In the second phase, we focused on examining how the students relate to the use of digital tools and technologies in the classroom, and how proficient they are in the areas of digital competence in information and data management, communication and collaboration, and the digital content creation. In the next phase of our research, we aim to elaborate developmental interventions that help in the development of digital competence during teacher training, and then to monitor whether the experimental attempts yield the expected results.

Keywords: Teacher Training, Digital Competence, Level of Competence, DigCompEdu, DigComp



# Introduction

The rapid advancement of information and communication technologies (ICT) has significantly impacted various aspects of life, including the realm of education (Casal, 2007; Shoraevna et al., 2021). Education systems around the world are faced with the challenge of how to prepare young people to participate in the information society. A fundamental component of this preparation is digital competence, which encompasses not only the ability to use digital tools but also the critical evaluation of information, the creation of digital content, and online communication skills (Pinto & Leite, 2020).

Teachers play a crucial role in enabling students to acquire these skills (Romero et al., 2021; Wang, 2024). However, this requires teachers themselves to possess a high level of digital competence. The experiences and knowledge gained during teacher training are pivotal in shaping how future educators meet these expectations. The European Union places particular emphasis on this issue, with initiatives like the DigCompEdu framework (Redecker, 2017) providing guidance for enhancing teachers' digital competence.

This study aims to investigate whether Hungarian teacher education students in Romania possess an adequate level of digital competence to facilitate effective knowledge transfer as future educators. The relevance of the study is that the modernization of teacher education and the conscious development of digital competences are essential not only for improving the quality of education, but also for social innovation and adaptability in the labour market.

# **Digital Competence in Teacher Education**

National and international research has significantly contributed to measuring and developing the digital competencies of teacher training students. These studies emphasize that the tools for assessing digital competence go beyond technical skills to include pedagogical and ethical dimensions, ensuring future teachers can effectively adapt to digital learning environments. Numerous frameworks and models highlight various aspects of digital competency and aim to support its evaluation and enhancement:

- UNESCO ICT Competency Framework for Teachers (ICT-CFT): This widely used international framework facilitates the definition and measurement of digital competencies in teacher education. It focuses on the pedagogical integration of information and communication technologies (ICTs) and encompasses skills such as ethical technology use, pedagogical innovation, and classroom application of ICTs (UNESCO, 2018; Falloon, 2020; Anaza, 2021).
- European Framework (DigCompEdu): Developed by the European Union, this framework outlines six areas of digital competency for teachers, including educational planning, assessment, and using digital tools in learning environments. It emphasizes lifelong learning and classifies educators' competencies into levels (e.g., novice, advanced, expert) (Reisoğlu & Cebi, 2020; Cabero-Almenara et al., 2023).
- ISTE Standards: Created in the USA, the ISTE (International Society for Technology in Education) standards have significantly influenced the measurement and development of digital skills in teacher education. These standards focus on the innovative use of technology for educational purposes (Vucaj, 2020; Crompton, 2023).
- International comparisons: Some studies compare different national frameworks, such as the European Teachers Competency and Qualifications Framework (eTQF). This project defines competencies and levels emphasizing technological skills and

pedagogical tools development. Such comparisons aid in creating tools better suited for educational professionals (Caena, 2014; Ngao et al., 2022).

Several significant studies have been conducted domestically to measure the digital competencies of teacher education students, employing various approaches. One important study involved the Hungarian-language adaptation of the DigCompEdu framework, which was implemented among participants in teacher training programs. This framework analyzes educators' digital competencies in terms of their applicability in educational practice. During the research, in addition to self-reflection, institutional support, and individual strengths, areas requiring development were also identified. The study placed particular emphasis on evaluating the state of teacher education, such as the use of tools and methodological integration (Horváth et al., 2020).

Another notable study examined the ICT competencies of instructors in teacher training institutions. The research analyzed educators' attitudes, activities, the types of tools and applications they used, as well as the level of institutional support across multiple dimensions. The findings highlighted the necessity for more effective integration of ICT tools, especially in university environments and across different training institutions (Komló, 2020; Tódor, 2022).

These studies provide valuable insights into the current state of digital competencies among future educators and underscore the importance of targeted support and training to enhance their ability to effectively incorporate digital technologies into their teaching practices.

#### **Presentation of the Survey**

Our research was conducted over two consecutive academic years, starting in 2022–2023, with the aim of assessing whether students possess the appropriate level of digital competence and identifying the support needed during their training to confidently use digital technologies in the future. For both surveys, we utilized custom-designed questionnaires.

In the first phase, we based our questionnaire on examples from the DigCompEdu and DigComp 2.1 frameworks. Questions were grouped into three areas: (1) What is the students' level of digital competence for learning based on the DigCompEdu framework, (2) What is their digital competence level according to the DigComp 2.1 framework, (3) What is the expected level of digital competence for school teachers, as outlined in the DigCompEdu framework.

The results indicated that most students could integrate digital technologies into their studies. However, 5–6% felt they lacked adequate knowledge for effective learning. Students rated their knowledge of the competence areas from the DigComp frameworks as above average, with only 1% considering their digital competence intermediate. Additionally, they agreed that schoolteachers should possess high levels of digital competence. The digital competence areas where there were gaps in knowledge were Problem Solving and Digital Content Creation (Harangus & Kovács, 2022).

The questions in our second survey were based on the findings of the first survey, and we focused on three main areas: (1) How students evaluated the use of digital technologies based on their prior experiences, and how much these technologies helped them in learning, (2)

How reliable they considered the information and data available on the internet, (3) How they perceive the role of digital learning materials in the teaching-learning process.

This phase emphasized students' attitudes toward using digital tools and technologies in classroom settings and their proficiency in information and data management, communication and collaboration, and digital content creation.

### **Presentation of the Sample**

The survey involved students from the Teacher Training at the Sapientia Hungarian University of Transylvania, location Faculty of Technical and Human Sciences Târgu Mureş, with a total sample size of 106 participants. The gender distribution was fairly balanced, with 51% male and 49% female students. The distribution by academic major was as follows: 33.7% in engineering-related fields (including engineering and computer science), 27.9% in agriculture, 24% in humanities, and 14.4% in social sciences. The higher proportion of engineering students (62%) reflects the educational offerings at the Târgu Mureş campus.

In terms of permanent residence, the sample distribution was: 31.7% from rural areas, 14.4% from villages, 11.5% from county seats, and 32.7% from cities, while 9.6% of participants did not provide this information. Therefore, 46% of the students came from rural environments, and 44% from urban areas. Regionally, the distribution was as follows: 1.9% from Braşov and Alba counties (minority areas), 1% from Bihor and Satu Mare counties (transitional areas), 23.1% from Harghita, 15.4% from Covasna, and 46.2% from Mureş county (majority area). The regional data clearly reflects the dominance of students from the Mureş county, which is consistent with the student population profile at the faculty.

# **Evaluation of Results**

# (1) The Role of Electronic Devices and Digital Content in Education

In the first phase, we measured how students assess the presence of electronic devices and digital content in education. The students were asked to rate their responses on a scale from 1 to 7 (1 = not at all and 7 = to a full extent).

	Mean	SD			
How much it aided the learning process					
the use of electronic devices	5.88	1.07			
the use of digital learning materials	5.95	1.10			
How useful do you find education					
electronic devices	6.02	0.99			
digital learning materials	5.91	1.11			
How useful do you find electronic devices in learning					
electronic devices	6.11	1.05			
digital learning materials	6.11	0.98			

Table 1: Electronic Devices, Digital Learning Materials in Teaching and Learning

The table below (Table 1.) shows that, overall, students found the use of electronic devices and digital content to be highly useful, assisting them in the teaching-learning process. However, by analyzing the distribution of the data, it is also noticeable that approximately 8-

14% of students believe that the use of digital tools does not help them in effective knowledge acquisition and retention, or in maintaining their attention.

We also explored students' views on the extent to which 21st-century teachers should use electronic devices and digital content in classroom teaching, as well as their own intended use as future educators. Comparisons to data collected in the 2015-2016 academic year (Harangus et al., 2017a, 2017b) reveal a significant shift. Previously, students believed that teachers did not need to be proficient in digital tool usage. Current data, however, underscore the importance students now place on teachers possessing strong digital competencies. This evolution highlights a growing recognition of the role of digital skills in effective education and the integration of technology into teaching methodologies.

### (2) Reliability and Use of Information Available on the Internet

Assessing the reliability of internet-sourced information and its correct application is crucial because the online space hosts both credible, scientifically validated resources and misleading, inaccurate, or manipulated data. With the overwhelming volume of information available online, students must develop the ability to distinguish reliable sources from deceptive ones. This capability is a core component of digital literacy, essential for navigating an information-rich society. Additionally, improper use of information can result in legal issues, such as copyright infringements.



Figure 1: Knowledge of Reference Modes (%)

We sought to understand how reliable students perceive online information to be by asking them to evaluate the credibility of internet-based resources based on their experiences. More than half of the students consider about half of the information, data, and content available online to be reliable. They recognize that not all information accessible on the internet can be deemed trustworthy. Although they perceive themselves as conscious information seekers, responses to knowledge-specific questions reveal that they are not always aware of which sources provide reliable information.

Despite having to prepare several essays, papers, and presentations during their studies, which required sourcing materials, nearly one-third of students are unaware that failing to cite

sources—whether from online or print materials—violates copyright laws. Specifically, 32.1% do not know that citing a source is mandatory for direct quotations, and 30.4% are unaware that the same applies when using content-based elements. Additionally, not all students (19.6%) understand that copyright law and intellectual property protection regulate and define the rules for content usage (Figure 1). For example, when using visual creations such as images, graphics, paintings, photographs, videos, animations, and so on, the author's permission and payment of royalties are required unless the work is freely available or classified as public content. About one-third of students (33%) are unfamiliar with these regulations, mistakenly believing that no specific permissions are needed or that simply notifying the creator is sufficient.

# (3) The Role of Digital Learning Materials in the Teaching-Learning Process

The knowledge and application of digital learning materials are crucial in the teachinglearning process, especially in the 21st-century educational environment. Digital learning resources serve as effective tools for knowledge transfer, increasing student engagement, and innovating pedagogical practices. They provide quick and flexible access to information while offering interactive opportunities that support individual learning processes. For educators, these materials create opportunities to expand teaching methods, such as integrating visual and interactive elements, which promote active student participation and engagement in the educational process.

In the first phase of our research, students indicated that their proficiency level in the area of digital content creation was inadequate. With our questions, we aimed to gain an understanding of how they would relate to the use of digital resources during teaching. 86% of the students consider it useful for students to use digital sources when solving homework, and 70% agree that homework should be completed digitally. Although they stated that they do not consider all information available on the internet to be reliable, 41% of them would still recommend using data from Wikipedia for students when preparing essays or homework.

The design and evaluation of the parameters of digital teaching materials are crucial, as these characteristics significantly influence the students' learning experience and the teachers' effectiveness in instruction. In the following, a seven-point Likert scale (1 - not at all, 7 - completely) was used to evaluate the importance of various characteristics that define the parameters of a digital learning material. Positive characteristics listed included: playful, humorous, interactive, varied, and engaging. All of these characteristics were rated above average with high scores. The most important factors for students were that the digital learning material be interesting, structured, and motivating, while playful elements and humor were considered significantly less essential.

They were also asked to evaluate, using a seven-point Likert scale (1 – not at all, 7 – completely), how important they considered certain elements that could form part of digital teaching materials. The listed elements were: audio tasks, links to reference sources, textual content, interactivity options, tests, multimedia elements, images, and animations. In this case, all elements were rated above average, although their opinions differed significantly regarding which elements should be included in digital learning materials. The visual presentation of digital content was considered the most important, while the options for interactivity—such as tests, branching paths, and choices—were deemed at least equally important components of a digital learning material.

Surprisingly, the importance of textual content was rated highly, even though, as educators, we continuously observe that students tend to avoid learning materials consisting of longer texts. Even if they do read them, these texts do not capture their attention. This evaluation indicates that our prospective educators recognize that a digital teaching material is successful if it includes well-developed and structured textual content. Surprisingly, many students did not fully understand the role of audio tasks. Mainly, translation major students were the ones who provided examples of how they would use such tasks in a classroom setting: "Audio tasks are necessary from time to time for variety, and because they evoke more realistic situations, making the learning experience a little more personal, interesting, and engaging for students, compared to silent work with text. They are necessary in language lessons because they teach the correct use of foreign or even native languages."

They were most open to using multimedia elements, images, or animations, particularly in biology, mathematics, and physics classes, where they saw them as most useful. However, several students also suggested using them in history and geography classes to capture attention, illustrate concepts, make the lesson more interesting and engaging, and provide a quicker and simpler overview of the material. They were creative when providing examples of how they would use these elements: "showing a short film about the historical background of the lesson," "in history, I see it as very useful, for example, pictures of the given period," "understanding algorithms," etc. The responses reflect that they see the application of multimedia teaching elements as beneficial in the teaching and learning process "in every case."

# Conclusions

One of the goals of this research was to explore how students perceive the role of electronic devices and digital content in education. The findings reveal that the majority of participants found digital tools to be highly beneficial in the teaching-learning process. However, data analysis also highlighted that some respondents felt these tools did not effectively contribute to knowledge acquisition or sustaining attention.

The research also examined students' opinions on the extent to which 21st-century teachers should use digital tools and how they themselves, as future educators, plan to incorporate such tools in classroom instruction. A significant change was observed compared to previous measurements: whereas earlier surveys indicated that students did not see digital proficiency as essential for teachers, the latest data underscore the growing importance students place on teachers' digital competencies.

Another objective of the study was to assess how reliable students consider online information and their awareness of credibility criteria. While over half of the participants regarded online content as somewhat reliable, questions testing specific knowledge revealed difficulties in distinguishing credible sources. Nearly a third of the students were unfamiliar with intellectual property regulations, particularly regarding the use of visual materials. A significant proportion (about one-third) incorrectly believed that no permission was needed to use such materials, or that merely notifying the author sufficed. These findings highlight the need to enhance digital literacy in higher education.

Digital learning materials play a crucial role in the teaching-learning process. Results show that students recognize the importance of various components of digital content, emphasizing the role of visual elements, such as images and animations, particularly in science and social

studies. They prioritize the structured and motivational aspects of digital materials but place less emphasis on gamified or humorous elements. The use of multimedia content, such as films or historical images, was suggested for their illustrative and engaging qualities, which make learning more accessible and interesting.

In summary, the findings shed light on the challenges and opportunities associated with developing digital competencies. They provide a solid foundation for future improvements in this area.

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# DK-PRACTICE: An Intelligent Educational Platform for Personalized Learning Content Recommendations Based on Students Knowledge State

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#### Abstract

This study introduces DK-PRACTICE (Dynamic Knowledge Prediction and Educational Content Recommendation System), an intelligent online platform that leverages machine learning to provide personalized learning recommendations based on student knowledge state. Students participate in a short, adaptive assessment using the question-and-answer method regarding key concepts in a specific knowledge domain. The system dynamically selects the next question for each student based on the correctness and accuracy of their previous answers. After the test is completed, DK-PRACTICE analyzes students' interaction history to recommend learning materials to empower the student's knowledge state in identified knowledge gaps. Both question selection and learning material recommendations are based on machine learning models trained using anonymized data from a real learning environment. To provide self-assessment and monitor learning progress, DK-PRACTICE allows students to take two tests: one pre-teaching and one post-teaching. After each test, a report is generated with detailed results. In addition, the platform offers functions to visualize learning progress based on recorded test statistics. DK-PRACTICE promotes adaptive and personalized learning by empowering students with self-assessment capabilities and providing instructors with valuable information about students' knowledge levels. DK-PRACTICE can be extended to various educational environments and knowledge domains, provided the necessary data is available according to the educational topics. A subsequent paper will present the methodology for the experimental application and evaluation of the platform.

Keywords: Personalized Learning, Machine Learning, Recommendation System, Intelligent Educational Platform

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#### Introduction

Learning is a fundamental aspect of human activity from birth onward, serving as the foundation for cultivating and expanding knowledge. In the educational process, knowledge is developed by engaging with various knowledge elements through appropriate educational materials. Educational technology enhances this process by employing strategies and tools to optimize learning and performance. These tools are applied in various educational settings, including formal, informal, or lifelong learning environments (Huang et al., 2019). Knowledge evolves over time, and this dynamic nature has been a key focus of research in the educational data mining field in recent years. Specifically, a student's knowledge improves when they acquire a new learning object such as a concept or skill. Maintaining, over time, the probability that the student has mastered various learning objects is called Knowledge Tracing (KT) (Corbett & Anderson, 1994). KT research first emerged in the 1990s, utilizing Bayesian models (Corbett & Anderson, 1994). This line of research has evolved, aligning with modern technologies and incorporating Machine Learning (Cen et al., 2006; Pavlik Jr. et al., 2009) as well as Deep Neural Network techniques such as Recurrent Neural Networks (Piech et al., 2015; Zhang et al., 2017; Yeung, 2019; Delianidi et al., 2021), Convolutional Neural Networks (Yang S. et al., 2020; Wang et al., 2020; Shen et al., 2020; Ma et al., 2021), or Graph Neural Networks (Yang Y. et al., 2020; He et al., 2021).

Estimating students' performance enables an evaluation of their knowledge state and supports the enhancement of their future learning outcomes by tracing their current knowledge. In the context of learning with an Intelligent Tutoring System (ITS), students' interactions are automatically logged as they interact with the system. These log files can be analyzed during the KT process to monitor how the student's knowledge state evolves over time. So, elearning constitutes a vital component of educational technology. Especially during the COVID-19, e-learning has become the primary global educational tool, creating unprecedented opportunities for learning beyond the traditional confines of time and space (Alqahtani & Rajkhan, 2020). Through e-learning, learners can access digital materials such as presentations, texts, videos, audio, and images from various sources, including structured courses on learning management systems, teacher websites, educational social networks, ebooks, and online repositories. To further enhance this learning experience, there is a growing need for smart applications that cater to individual student needs by delivering personalized educational content within online learning environments.

One example of such intelligent applications is Educational Recommendation Systems. These systems offer personalized suggestions to tailor learning experiences to individual students' needs (Hukkeri & Goudar, 2022). In today's era of digital learning and information overload, personalization plays a critical role in improving students' performance and knowledge evolution. Advances in machine learning and recommendation technologies have opened up promising opportunities for education. Their use enhances learning for students, instruction for teachers, and resource management for institutions (Zou, 2011). Beyond traditional education, these systems also support lifelong learning, addressing the increasing demand for ongoing skill development in modern society. Educational recommendation systems are reforming traditional learning by fostering innovation in teaching and education aims to assist students and teachers in multiple ways. For instance, by providing users with relevant resources - such as articles, books, videos, and courses - these systems help save time and effort in searching for information while enabling the discovery of new resources that might otherwise be overlooked (Belarbi et al., 2019; Kim et al., 2019; Gulzar et al., 2018).

Additionally, recommendations based on users' past behaviors, such as courses they've taken (Shin & Bulut, 2022), or preferences, like learning styles or interests (Giang et al., 2023), not only enhance accuracy but also make it easier to locate necessary information. This is particularly valuable in online learning, where vast amounts of information are dispersed across the internet.

Drawing inspiration from research in knowledge tracing and educational recommendations, in this paper we introduce the DK-PRACTICE, an intelligent platform designed to support adaptive learning and deliver tailored educational recommendations to learners, utilizing machine learning and deep learning methods. Based on Machine Learning and Deep Learning methods, the platform combines the knowledge tracing task and targeted educational content recommendation after first discovering the learner's knowledge gaps through their participation in a short test.

### Main Purpose

The DK-PRACTICE platform is an intelligent system designed to deploy personalized educational recommendations, utilizing machine and deep learning to create an adaptive learning environment tailored to each student's needs. Starting with an initial assessment to identify knowledge gaps, it recommends targeted learning materials. This process includes a brief interactive placement test and the analysis of students' past question-and-answer interactions. DK-PRACTICE aims to strengthen students' foundational knowledge, offering self-assessment opportunities and supporting exam preparation. Tutors can also quickly gauge students' knowledge levels, enhancing teaching effectiveness. The determination of students' personalized educational requisites is initiated through a succinct personalized interactive knowledge placement test, supplemented by analysis of students' historical interactions. Leveraging this information, the DK-PRACTICE platform generates personalized recommendations aimed at enriching the student's knowledge and academic achievements. Beyond the platform's development, our principal aim is to fortify students' educational fundamentals through an interactional process with the platform. By detecting knowledge gaps, the DK-PRACTICE platform facilitates the provision of suitable educational content for the students' knowledge remediation. The creation of this platform is motivated by several factors, notably affording students the opportunity to assess their knowledge, particularly in anticipation of examinations. Moreover, DK-PRACTICE aims to equip tutors with an expeditious means to gauge the cognitive proficiency levels of their students, thereby enhancing pedagogical efficacy. In summary, the main objectives of the **DK-PRACTICE** platform are:

- to improve the performance of students based on their past interactions (i.e. responses to test questions),
- to dynamically recommend appropriate, personalized educational content in a specific subject of study,
- to explore the student's knowledge before a test or as an auxiliary tool for the tutors to know the knowledge level of their students.

# **DK-PRACTICE** Architecture

The architecture of the DK-PRACTICE platform includes two main components (Fig.1):

• The first component combines a recurrent Deep Learning (DL) model with a classification sub-network to estimate the student's knowledge state (Fig.2).

• The second component applies Machine Learning (ML) algorithms in order to produce educational content recommendations (Fig.3).

Both, the Knowledge Tracing task and the Knowledge State estimation are accomplished by utilizing the student's interaction history.



Figure 1: The DK-PRACTICE Architecture

### **Knowledge Tracing Model**

The knowledge tracing model is based on previously published work (Delianidi & Diamantaras, 2023). As depicted in Figure 2, the interaction involves administering a question-and-answer test, with initially encoded questions and responses. The historical record of question-answer pairs serves as input to the DL model to estimate the student's knowledge state. This estimated knowledge representation, alongside a new, previously unseen question, is fed into a classification network. The network then calculates the probability of the student's correct response, referred to as the "predicted response" r'. The "predicted response" is the element that affects the choice of the next question q, which is different for each student during the test. It contributes to the list of content recommendations after completing the test.



Figure 2: The Knowledge Tracing Model

#### **Recommendation Approach**

The Recommendation Engine (Fig. 3) produces two types of recommendations:

- a) the "Next question" and
- b) the "Educational Recommendations".

There is a question bank where each question concerns a knowledge component and arises from a specific concept. Initially, the system selects a random question. Depending on the student's response, it estimates the probability of answering correctly all the questions in the question bank. Drawing inspiration from the NeurIPS 2020 Education Challenge,<sup>1</sup> we define an ambiguity threshold  $\alpha$ , the value of which is compared to the probability of answering correctly to the questions. The higher the probability of the "predicted response" r', which was the output of the knowledge tracing component, the better the student's knowledge of the concept to which the question refers. In the case where the probability of the "predicted response" r' is below a certain threshold  $\alpha$ , the system believes that the student does not sufficiently understand the concepts referred to in the question. On the other hand, the smaller the difference between  $\alpha$  and the estimated probability of correctness r' for each question q, the greater the system's doubt about the student's knowledge state per concept.

# If $r'_q \cong \alpha$ , then "Next question" = q

Consequently, guided by the prediction of the DL model, the question q chosen is the one that has the predicted probability r' approaching  $\alpha$ , where  $\alpha=0.5$ . The reason for this choice is to prompt the student to answer a question which the model has the most difficulty to classify as likely to be answered correctly or not. In any case, the "Next question" recommendation differs for each student and depends on their current performance during the short test interactions.



Figure 3: The Recommendation Model

Following a sequence of interactions between the student and the platform, wherein each student responds to personalized questions, the system identifies the student's areas of knowledge deficiency. Subsequently, it proposes educational materials aimed at addressing these knowledge gaps. Within the framework of the DK-PRACTICE platform, we have established the personalized question *quota* at *10*. This numerical threshold constitutes a hyperparameter and is subject to occasional adjustments following preferences, experimental findings, course requirements, and similar factors. Based on the student's responses, the recommendation engine is tasked with recommending pertinent educational content conducive to enhancing the student's knowledge proficiency. All this process is supported by a data model which is organized into a database, a training dataset, and a database of educational content. Finally, the recommended educational content is related to the educational concepts that the student has to learn.

<sup>&</sup>lt;sup>1</sup> NeurIPS 2020 Education Challenge, https://eedi.com/projects/neurips-education-challenge

#### **Data Model**

Data is one of the most fundamental components of the DK-PRACTICE platform. It is essential for the operation of any type of application that uses machine learning. The data model of the platform is depicted in Figure 4. The database contains the entities for the questions, the educational concepts, the information about the educational content as well as the relationships between the entities. The dataset consists of the interaction of questions and answers history and is used to train the machine learning models. The data related to the Exams is used to train the Knowledge Trace Model after anonymization.



Figure 4: Data Model

#### Implementation

The DK-PRACTICE platform was developed using Laravel<sup>2</sup> framework, one of the most popular PHP frameworks for developing web applications. A major advantage of Laravel is its extensive support for integrating external packages, allowing developers to easily extend the capabilities of their applications. The application connects to an API (Application Programming Interface), implemented in Flask,<sup>3</sup> and supports two-way communication with the machine learning models, as the "*Next question*" suggestion and the final list of "*Educational Recommendations*", i.e. educational content recommendations are sent through the API as it enables the Machine Learning model to be leveraged through the developed application.

The DK-PRACTICE platform allows two types of users: the administrator and the student. The administrator has the right to create a test by entering all the relevant information and to set parameters such as the number of test questions and tests a student can take. The

<sup>&</sup>lt;sup>2</sup> Laravel - Wikipedia, En.wikipedia.org, https://en.wikipedia.org/wiki/Laravel

<sup>&</sup>lt;sup>3</sup> Welcome to Flask - Flask documentation, https://flask.palletsprojects.com/en/3.0.x/

administrator can also monitor statistics and the performance of the students. Figures 5-10 present the platform's administrator environment functionalities.

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Figure 5: Administrator Environment - Users

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Δ				1 month ago
	-			1 month ago

Figure 6: Administrator Environment - Students

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Figure 7: Administrator Environment – Edit Student

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Microelectronics	2	2 months ago	2 months ago	🗷 Edi
Processor performance	1	2 months ago	2 months ago	🗷 Edi
CPU structure	1	2 months ago	2 months ago	🖉 Edi
ARM architecture	2	2 months ago	2 months ago	🕑 Edi
Cloud computing	6	2 months ago	2 months ago	🗷 Edi
History	6	2 months ago	2 months ago	🗷 Edi
Embedded systems	4	2 months ago	2 months ago	🗷 Edi
Microcontrollers	2	2 months ago	2 months ago	🖉 Edi
Performance measures	2	2 months ago	2 months ago	🖉 Edi

Figure 8: Administrator Environment – The Concepts

Je	stions					Ne	w ques
					Q s	earch	
	Concept ~	Title $\checkmark$	Chapter 🗸	Answers count $\lor$	Created at $\lor$	Updated at $\lor$	
	Cache mapping	[0.4/4] Cache direct mapped	4.3	4	2 months ago	2 months ago	C E
	Cache mapping	[0.4/4] Cache set associative 2	4.3	4	2 months ago	2 months ago	🗷 E
	Microelectronics	[0.4/4] Chip	1.2	4	2 months ago	2 months ago	C E
	Processor performance	[0.4/4] CISC_RISC επηρεάζουν CPI	2.4	4	2 months ago	2 months ago	🖉 E
	CPU structure	[0.4/4] Εσωτερική δομή CPU	1.1	4	2 months ago	2 months ago	🗹 E
	ARM architecture	[0.4/4] Kɛφ1 CISC_RISC	1.6	4	2 months ago	2 months ago	🕑 E
	Cloud computing	[0.4/4] Κεφ1 laaS (α)	1.7	4	2 months ago	2 months ago	C E
	Cloud computing	[0.4/4] Κεφ1 IaaS (β)	1.7	4	2 months ago	2 months ago	C E
	Cloud computing	[0.4/4] Kɛตุ1 PaaS (figure)	1.7	4	2 months ago	2 months ago	🕑 E
	Cloud computing	[0.4/4] Κεφ1 PaaS (α)	1.7	4	2 months ago	2 months ago	Ø E

Figure 9: Administrator Environment – The Questions Bank<sup>4</sup>

The student has the right to perform the permitted number of tests, to see the correctness of the answer to the question. By default, the number is set to 2 tests: the first to identify the student's knowledge gaps after completing the test, and the second, after receiving and studying the list of educational content recommended by the platform. Statistics are presented in both administrator and student environments (Figures 10, 11).

ests				
Correct answers	Wrong answers	Created at	Updated at	
6	4	2024-10-30 14:17:31	2024-10-30 14:17:31	View
4	6	2024-10-29 17:28:04	2024-10-29 17:28:04	View

Figure 10: Student's Tests List

<sup>&</sup>lt;sup>4</sup> The questions are in Greek because the course is taught in Greek.

tats			
orrect answers		Wrong answers	
0		4	
esults Answers			
Concept	Chapter	Concept	Chapter
Performance laws	2.3	PCI	3.6
Concept	Chapter	Concept	Chapter
Magnetic disk organization	6.1	ARM architecture	1.6
Concept	Chapter	Concept	Chapter
Programmed I/O	7.3	Performance measures	2.4
Concept	Chapter	Concept	Chapter
Magnetic disk organization	6.1	Error correction	5.2
Concept	Chapter	Concept	Chapter
Cloud computing	17	APM architecture	16

Figure 11: Statistics and Recommendations According to Test's Results

#### **Discussion and Future Work**

The DK-PRACTICE platform has undergone preliminary testing within the context of the "Computers Organization and Architecture" course. These initial trials aim to evaluate the platform's technical functionality, identify bugs, and ensure a seamless user experience in preparation for broader deployment. Early feedback indicates that the platform effectively integrates knowledge tracing and personalized recommendations, supporting adaptive learning through data-driven methodologies. The pilot deployment has also provided valuable insights for optimizing the knowledge tracing model, which currently achieves an accuracy of 78.11% and an AUC (Area Under Curve) of 80.49%, using anonymized historical data from previous exam cycles. Moving forward, several key initiatives are planned to improve and expand the platform. A critical next step includes evaluating the educational effectiveness of the platform's recommendations. This will be achieved through a pilot operation by groups of students to prepare for the final exams of the course a few weeks in advance. This will allow for the evaluation of the recommendations of the proposed educational material, the impact and retention of knowledge, and the effectiveness of academic performance. In order to collect comprehensive feedback from users, we plan to distribute a detailed questionnaire. This survey will record students' perceptions of the usability of the platform, the accuracy of knowledge state assessments, and the relevance of content suggestions. According to user feedback, the system can be improved to better meet the needs of students.

Another point is to expand the scope of testing to include diverse courses and larger student groups. Such testing will provide more datasets, enabling further improvement of the machine learning models underlying the knowledge tracing and recommendation components. We also aim to explore incorporating additional educational domains, which would demonstrate the platform's adaptability and scalability. Finally, we plan to extend the platform's functionality beyond academic contexts to professional training environments. By using the relevant datasets and adapting the knowledge tracing and recommendation systems to identify and address skill gaps in employees, the platform could serve as a versatile tool for continuous professional development. With ongoing improvements, DK-PRACTICE has the potential to become a transformative educational technology, supporting personalized and effective learning experiences across a wide range of domains.

#### Conclusion

This paper introduces DK-PRACTICE, an intelligent educational platform designed to facilitate adaptive and personalized learning through educational recommendations based on students' knowledge states. By leveraging machine learning and deep learning techniques, DK-PRACTICE offers an innovative approach to enhancing the learning experience. The platform integrates knowledge tracing to assess individual knowledge gaps and uses these insights to recommend targeted educational content tailored to each student's specific knowledge needs. It also provides instructors with valuable information to understand and address their students' knowledge deficiencies. One of the platform's useful features is its dynamic assessment mechanism, which enables students to undergo short, interactive tests that identify knowledge gaps. The content recommendations, generated by the machine learning components, focus on these gaps, ensuring a targeted and efficient learning process. The inclusion of pre- and post-tests, along with detailed performance reports, allows students to monitor their progress.

The adaptability of DK-PRACTICE is another significant advantage. The platform's architecture supports extension across different educational subjects and levels, making it versatile for various contexts. Additionally, its potential applications extend beyond traditional education settings to professional training environments, where it could play a pivotal role in identifying and addressing skill gaps among employees. By tailoring recommendations to individual learning requirements, DK-PRACTICE can contribute to lifelong learning and workforce development initiatives. However, challenges remain in fully realizing the platform's potential. Technical improvements, such as enhancing the robustness of the recommendation engine and integrating more sophisticated deep learning models, are critical next steps. In conclusion, DK-PRACTICE represents a promising step forward in personalized educational technology. By combining advanced machine learning methodologies with a user-centered design, the platform demonstrates its capacity to transform traditional learning paradigms. Future developments will focus on refining its capabilities and expanding its applicability, aiming to establish DK-PRACTICE as an intelligent platform for adaptive and personalized education for students, tutors, and professionals.

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# Short Version of the Basic Psychological Need Satisfaction Scale: A Study With Higher Education Students in Portugal

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#### Abstract

The Self-Determination Theory proposes autonomy, competence, and relatedness as three psychological needs that are intrinsically linked to the mental health, well-being, and academic success of higher education students. This study aimed to validate a shortened version of the Basic Psychological Need Satisfaction Scale for the population of higher education students in Portugal. Participants (N = 800) were recruited online and responded to the 12 items of the scale along with a sociodemographic questionnaire. The sample was randomly divided into two sub-samples for exploratory factor analysis (EFA; n = 380) and confirmatory factor analysis (CFA; n = 420). The EFA results suggested a 3-factor structure, corresponding to the needs for autonomy, competence, and relatedness. The adequacy of this structure was supported by the CFA results. All subscales demonstrated adequate internal consistency ( $\alpha = .68$  to .85) and moderate correlations (r = .63 to .68) with subjective wellbeing, confirming the convergent validity of the measure. The findings support the use of the scale in psychoeducational interventions in higher education and in research, particularly in identifying institutional factors that contribute to enhancing students' positive functioning.

Keywords: Basic Psychological Needs, Scale Adaptation, Higher Education, Subjective Well-being

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#### Introduction

In the field of Positive Psychology (e.g., Seligman, 2011), well-being and the satisfaction of psychological needs are fundamental dimensions of positive psychological functioning, strongly linked to academic success. The concept of basic psychological needs is central to Self-Determination Theory, which connects psychological functioning to the characteristics and opportunities of various contexts. According to the Self-Determination Theory (SDT), all human beings have psychological needs for competence, autonomy, and relatedness. These three needs form integral components of the human organism's adaptive design: engaging in meaningful activities (autonomy), exercising skills (competence), and creating and maintaining social connections (relatedness) (Deci & Ryan, 1985; 2000). These needs are innate and universal, requiring continuous satisfaction for healthy development and functioning. Satisfying these needs fosters autonomous motivation, well-being, and effective performance (Ryan & Deci, 2017). Within this framework, psychological needs are viewed as inherent tendencies of the human organism toward growth, integration, and flourishing.

According to SDT, the satisfaction of basic psychological needs directly influences wellbeing, with each need making an independent contribution (Deci & Ryan, 1985, 2000). The effects of specific behaviors or events on well-being depend on how they support or hinder the satisfaction of these needs (Ryan, 2009). Importantly, the satisfaction or frustration of basic psychological needs can yield positive or negative outcomes, respectively, with corresponding effects on health and well-being. Well-being thus reflects both individual success and the quality of the social and academic environment that fosters development. For instance, research confirms that inclusive environments positively affect well-being (Marcionetti et al., 2017; Laranjeira & Teixeira, 2024).

In this context, psychological assessment serves as a powerful tool for addressing the complex challenges of development, well-being, and academic success at both the individual student level and within the educational community. Effective psychological assessment relies on accurate and valid instruments that measure students' psychological functioning and provide insights into contextual factors influencing success and development.

This study aims to examine the psychometric properties of the Basic Psychological Need Satisfaction Scale (BPNSS; Deci & Ryan, 2003; Gagné, 2003), focusing on internal consistency and validity indicators. For validity, particular emphasis is placed on the scale's internal structure as evidence of construct validity and its relationship with well-being as a criterion for evaluating convergent validity. This criterion is especially relevant in the context of higher education.

#### Method

#### Participants and Procedures

A convenience sample of 800 higher education students (65% female; 87% national) from several Portuguese universities participated in the study. Participants' ages ranged from 18 to 75 years (Med = 24, IQR = 20). About 70% were undergraduates, 24% were master's students, and 6% were Ph.D. students. The full sample was randomly divided into two independent subsamples, enabling the conduct of exploratory factor analysis (EFA) on the first subsample (n = 380) and confirmatory factor analysis (CFA) on the second subsample (n = 420).

The study received approval from the Ethics Committee of the Faculty of Psychology, University of Lisbon. Program coordinators from 73 higher education institutions nationwide were contacted to assist in distributing the online survey link via email. The survey was conducted using Qualtrics. After providing informed consent, students voluntarily and anonymously completed the questionnaires, which required approximately 10 minutes.

# Instruments

#### Basic Psychological Need Satisfaction Scale.

The Basic Psychological Need Satisfaction Scale (BPNSS; Deci & Ryan, 2000; Gagné, 2003) consists of 21 items designed to assess the satisfaction of three core psychological needs: autonomy, competence, and relatedness. In this study, only the 12 positively phrased items were used, resulting in a shortened version. The scale measures the extent to which individuals perceive their psychological needs as being fulfilled in general. Respondents rate each item on a seven-point Likert scale, ranging from 1 (*Not at all true*) to 7 (*Very true*). The items were translated into Portuguese by a team of four researchers in Educational Psychology. Each researcher initially translated the items individually, after which the team met to discuss and agree on the best translation for each item.

# Flourishing Scale.

The Flourishing Scale (FS; Diener et al., 2009) includes eight items that assess different aspects of positive functioning, such as positive relationships, feelings of competence, and a sense of meaning and purpose in life (e.g., "I am engaged and interested in my daily activities"). This unidimensional scale is designed to measure the overall construct of subjective well-being. Participants rate each item on a seven-point Likert scale, ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). The Portuguese version of the FS has shown strong internal consistency ( $\alpha \ge 0.78$ ) and high convergent validity with similar scales (Silva & Caetano, 2013).

#### Results

# **Exploratory Factor Analysis**

EFA was conducted using Principal Axis Factoring with oblimin rotation. The Kaiser-Meyer-Olkin measure indicated excellent sampling adequacy (KMO = .92). Three factors were extracted based on eigenvalues greater than 1, explaining around 52.09% of the total variance. The first factor, relatedness, included items 2, 6, 9, 12, 14, and 21, accounting for 43.72% of the variance. The second factor, competence, encompassed items 5, 10, and 13, explaining 5.15% of the variance. Finally, the third factor, autonomy, was represented by items 1, 8, and 17, explaining 3.21% of the variance. All factor loadings exceeded |.50|.

# **Confirmatory Factor Analysis**

The factor structure identified in the EFA was tested using CFA in a first-order model. Model fit indices indicated a good fit ( $\chi^2 = 160.72$ , df = 51, p < .001,  $\chi^2/df = 3.15$ ; CFI = .94; TLI = .92; RMSEA = .07; SRMR = .05). All factor loadings were statistically significant, ranging from  $\lambda = .56$  to .81, supporting the adequacy of the measurement model.

## **Descriptive Statistics and Reliability**

Table 1 displays the descriptive statistics of the study variables. The range of scores indicates variability in participants' responses. Mean values suggest that participants perceived their three psychological needs as moderately satisfied.

Internal consistency for the psychological needs subscales was assessed using Cronbach's alpha coefficients, ranging from  $\alpha = .68$  to .85, indicating adequate to good reliability.

#### **Convergent Validity**

Convergent validity was examined through correlations with subjective well-being, with all correlations being positive and moderate, ranging from r = .63 to .68 (Table 1). Additionally, the correlations among the three psychological needs were also significant and moderate.

Table 1: Descriptive Statistics, Internal Consistency and Correlations					
Variable	Range	M(SD)	1	2	3
1. Autonomy	1-7	5.29 (1.22)	$\alpha = .74$		
2. Competence	1-7	5.20 (1.12)	$.58^{***}$	$\alpha = .68$	
3. Relatedness	1-7	5.46 (1.02)	$.59^{***}$	$.58^{***}$	$\alpha = .85$
4. Well-Being	1-7	5.46 (1.14)	.64***	$.68^{***}$	.62***

*Note.* \*\*\* *p* < .001

#### Conclusion

The psychometric properties of the shortened Portuguese version of the BPNSS were thoroughly assessed in this study. The results from the EFA revealed a three-factor structure corresponding to the three theoretically expected psychological needs. The CFA also supported the three-factor model, demonstrating a good fit. Cronbach's alpha coefficients indicated adequate to good reliability for the subscales. Convergent validity was examined through correlations with subjective well-being, which were all significant and moderate.

These findings align with those obtained using the original scale (Deci & Ryan, 2000; Gagné, 2003). Despite its shortened format, the three-factor structure was replicated in the Portuguese adaptation of the scale. The relationships among the three variables align with theoretical expectations and appear unaffected by sample characteristics or the study context. Evidence suggests a clear distinction among the three need factors, reinforcing the multidimensional nature of the construct. Studies focusing on the psychometric analysis of psychological need satisfaction measures are scarce, highlighting the importance of developing and adapting tools that conceptualize autonomy, competence, and relatedness as three distinct factors rather than dimensions of a higher-order factor. Such a hierarchical conceptualization could imply the simultaneous satisfaction of all three needs, which is inconsistent with Self-Determination Theory (Johnston & Finney, 2010).

Overall, the findings support the Portuguese version of the BPNSS as a reliable and valid tool for measuring psychological need satisfaction among higher education students. The scale can be valuable in students' psychological assessment and has the potential to guide interventions and policies that foster autonomy, competence, and relatedness, thereby enhancing student well-being and academic success.

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#### Current Trends in Teaching of Physical and Sports Education in Slovak Schools

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#### Abstract

Physical and sports education in schools represents a purposeful educational activity that contributes to increasing the physical fitness and movement performance of students, helps young people to acquire basic theoretical and practical physical education and create a positive relationship to physical activity throughout their lives. Despite its invaluable importance it faces many problems in Slovakia, e.g. children's laziness and lack of interest in movement not only during lessons but also in free time, unsatisfactory spatial and material equipment for teaching, insufficient scope of physical and sports education lessons, insufficient support from parents and family, low financial evaluation of teachers, unequal status of the subject among other teaching subjects, increasing number of non-exercising pupils and other. The paper deals with key issues related to the teaching of physical and sports education in Slovakia. It points to the importance of physical education and building children's relationship to sports and physical activity as part of a healthy lifestyle and a prerequisite for the ability to take care of one's health throughout life, and characterizes physical education and sports activities in schools in 30 European countries. It also presents the results of research into the opinions of Slovak primary and secondary school teachers of physical and sports education focused on their view of teaching and selected problems of physical and sports education in Slovakia. In the final part, recommendations are proposed for the identified most serious problems of physical and sports education and the improvement of the teaching of this subject in Slovak schools.

Keywords: Physical Education, Sport, Teaching, Health, School

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# Introduction

Physical and sports education in schools represents a purposeful educational activity that contributes not only to increasing the physical fitness and movement performance of students but also helps young people to acquire basic theoretical and practical physical education and to create a permanent positive relationship to physical activity throughout their lives.

The general goal of physical and sports education as a teaching subject is to enable students to develop fitness and coordination skills at an appropriate level, to acquire, improve and consolidate movement habits and skills, to increase their movement literacy, to increase general movement performance and fitness, and through the physical activity performed to act and take care of health, create a permanent relationship to physical activity, physical education and sports with regard to their interests, prerequisites and individual needs as part of a healthy lifestyle and the assumption of the ability to take care of one's own health throughout life (Bebcakova, 2009).

The specific goals of physical and sports education are aimed at acquiring movement, cognitive, communication, learning, interpersonal and attitudinal competencies.

Never in history has there been a greater need to devote yourself to physical education and sports than it is now. Since the standard of living is constantly increasing and people are buying various new technologies that make their life or mobility easier, the natural activities that force people to move have significantly decreased. Often sports and outdoor movement are replaced by computer games, the Internet and social networks. The result of long-term sitting of children in front of computers is poor movement, imbalance of muscle groups and a wide range of painful conditions in the future. Lack of movement is one of the biggest problems of the 21st century.

Scientific knowledge and research unequivocally confirm the positive contribution of regular physical activities not only to the health of children but also to adults. That is why it is important that children already in the lowest grades of primary schools have high-quality physical and sports education. From the time they enter the school system, children should be motivated to understand why it is important to move. They should gradually realize that the quality of their life increases thanks to movement. An important role in the whole process is played by parents who should set an example for their children. According to WHO estimates, up to 81% of children between the ages of 11 and 17 do not have at least 60 minutes of at least moderately intense exercise per day (Pasuth, 2021).

# **Physical Education and Sport in Schools in Europe**

Physical and sports education in schools contributes not only to improving the physical fitness and health of students but also forms knowledge and skills such as teamwork and fair play, cultivates consideration for other people, and teaches understanding of the "rules of the game" applicable in other subjects as well and other life situations. In order to map the situation in the field of physical education and sports activities in the schools of European Union countries, the Eurydice department, in cooperation with the General Directorate of the European Commission for Education and Culture, prepared a study in 2013 entitled Physical Education and Sport. Eurydice is an information network that is a means of the European Commission for collecting and disseminating information about the education systems in the European Union states, in order to facilitate European cooperation in the field of education, in
schools in Europe. 30 countries within the Eurydice network were involved in the above mentioned study. The aim was to map the situation and describe the role played by physical and sports education in schools in contemporary Europe. The report covers primary and lower secondary education and provides an overview of the following topics:

- National strategies and large-scale initiatives regarding physical education and physical activity.
- The position of physical education in national educational plans and in governing documents.
- Recommended annual time allowance for physical education, comparison with other subjects.
- Assessment of pupils in physical education.
- Qualification of physical education teachers.
- After-school physical activities.
- Planned reforms in physical education and sports activities.

Based on the results of the survey, the following main facts were identified (Eurydice, 2013):

- All European countries recognize the importance of physical education in schools. This subject is part of all educational programs and is compulsory in primary and lower secondary education. They consider exercise and sports activities to be a beneficial way of spending free time.
- Approximately half of the countries have developed a national strategy to support the development of physical education and physical activities. The governing documents emphasize the contribution of physical education in terms of physical, personal and social development of pupils. Some countries have introduced a separate subject of Health Education. Also, in some countries certain activities in physical education are compulsory, in other countries schools can choose the activities they will teach.
- Regarding the recommended minimum time allowance for physical education, there are relatively large differences between individual countries (Figure 1). The time allocation during compulsory education is on average 50–80 hours per year. Compared to other subjects, however, it is relatively low, as its share usually amounts to less than 10% of the total teaching time, and compared to mathematics, it is roughly half. A similar situation exists within the framework of daily compulsory secondary education, where the share of time allowance for physical education is approximately half compared to mathematics.



Figure 1: Minimum Time Allowance for Physical Education as a Compulsory Subject Expressed as Share of Total Teaching Time in Primary and Full-Time Compulsory General Secondary Education (Eurydice, 2013)

- Assessment of pupils in physical education takes place in different ways in individual countries. Almost all countries assess individual progress and achievement in physical education, although in the first four grades this assessment does not take the form of a formal classification. Both formative and summative assessment are used in primary and lower secondary education, with summative assessment being slightly more common. The grading system is usually the same as in other compulsory subjects.
- As for physical education teachers, at the primary level the subject is taught by nonspecialized teachers or specialized teachers. In some countries, schools can decide for themselves whether to entrust this teaching to a non-specialist or a specialist teacher. This decision mainly depends on the availability and distribution of teachers' duties at individual schools. At lower secondary level, specialized teachers are the norm. European countries offer opportunities for further education in the field of physical education not only for specialized physical education teachers but also for universalists and specialists in other subjects. This supports an interdisciplinary approach to physical education and the inclusion of regular exercise activities in other subjects.
- Physical education is taught within the regular timetable. After-school activities supplement or expand the range of physical activities. They are often focused on competitions or other events organized by schools and school clubs or in partnership with other entities. Several countries are trying to include more physical activities in the regular school practice and to engage in them during the day, during breaks or even on the way to school. Schools in Slovakia can establish physical education clubs.

Pupils receive educational vouchers from the Ministry of Education, Research, Development and Youth of the Slovak Republic, which they can use to finance the physical activities of these groups.

• Roughly a third of the surveyed countries planned reforms related to physical education during the survey period. Some countries focused on the introduction of new national strategies to support physical education and sports, and reforms of educational programs regarding e.g. time allowance, subject content, assessment of pupils' progress. Furthermore, the reforms directly affected the education of physical education teachers and the improvement of sports equipment and infrastructure.

#### **Physical and Sports Education in Slovakia**

Similar to other European countries, school physical and sports education in Slovakia has undergone intensive development and many changes in recent years. According to research, 70% of school-aged children and youth in Slovakia spend more than 4 hours of free time per day sitting at the computer, watching TV and playing with mobile phones. Only every third pupil engages in regular movement activity. Children and youth are dominated by a sedentary lifestyle, which brings with it an increase in obesity, overweight, poor posture and other health disorders. According to research, approximately 18% of children are overweight and approximately 7% are obese, while the situation is constantly worsening (Antala, 2014).

The best prevention against health disorders is sufficient physical activity. According to the recommendations of the World Health Organization (WHO), children and adolescents aged 5-17 should perform physical activity of moderate to vigorous intensity for an average of 60 minutes a day during the week and limit the time spent sitting (UVZ SR, 2024).

Physical and sports education is the only school subject that develops motor skills, and students here acquire physical education and the necessary knowledge to take care of their health. Economic calculations show that investing 1 euro in physical education of children and youth in schools will save 3 euros in the future needed to treat health disorders and civilization diseases resulting from their physical inactivity (Stupak, 2017).

Stagnation, or the decline in the physical performance of the school population in Slovakia, detected in the 1990s, is constantly deepening. It affects more boys than girls. The decline in the 1990s was most pronounced among students of the 2nd grade of primary schools, especially after the reduction in the number of hours of compulsory physical education in 1996 from 3 to 2 hours per week (Antala, 2014). However, from September 2023, elementary school students in the Slovak Republic will again have a mandatory minimum of three hours of physical education per week, and secondary school students two hours. This follows from the amendment to Act No. 245/2008 Coll. on Education (School Act), which was approved by the Parliament of the Slovak Republic in June 2023.

When comparing the movement performance of children and youth in the past and today, it can be concluded that the current school population is in most indicators of movement performance at a lower level than their peers 25 years ago. The same is true of athletically talented youth which is reflected in the fact that more and more applicants with a lower level of motor performance and literacy are applying to study physical education and sports at universities than in the past (Antala, 2014).

From the point of view of the popularity of the subject among primary and secondary school students in Slovakia, physical and sports education is a very popular or favourite subject for most primary and secondary school boys, while it is more popular in primary schools than in secondary schools. Only a minimal part of the boys considers it unpopular or do not like it at all. Among girls, the popularity of the subject is at a lower level than among boys. This is particularly evident in secondary schools (Antala, 2012).

# **Opinions of Slovak Primary and Secondary School Teachers of Physical and Sports Education Focused on the Problems of Teaching**

Despite many benefits, not only in terms of physical effects on the body but also in obtaining mental-physical balance, the position of the subject of physical and sports education in Slovakia is not very flattering.

In 2020, a research was conducted in the Slovak Republic, the aim of which was to obtain new knowledge regarding the opinions of physical and sports education teachers of primary and secondary schools on selected problems of teaching this subject. Among the most significant research findings are the following negative results (Balga, 2020):

- Physical and sports education is considered a less important subject in Slovakia, especially from the point of view of the parents of pupils, but also from the point of view of some fellow teachers.
- The majority of physical education and sports teachers are not satisfied with the workload or salary evaluation (a lot of administrative duties, bureaucracy, a lot of non-teaching obligations).
- A high number of students not exercising in Physical Education and Sports classes for various reasons (laziness of students, health reasons, forgetting exercise clothes, lack of interest in exercise, repetition of problematic student behaviour).
- Unfavourable level of spatial and material conditions (inadequate premises for teaching, poor technical condition of sports grounds, neglected maintenance, poor equipment, etc.).

The mentioned problems, as well as many others, have persisted for a long time. According to Bebcakova (2009), the insufficient financial evaluation of teachers and the material conditions of teaching physical education largely cause its decreasing level and status as a physical education teacher. Another problem is staffing, which is worst in the 1st grade of primary schools. There is up to 63.5% migration of university graduates with approval in physical education (Simonek, 2002). However, the latest surveys indicate that up to 85% of physical education students do not want to practice this profession after graduation (Lakoova, 2006). It is also possible to observe the constantly decreasing readiness of applicants to study physical education at universities. At universities, on the one hand, the demands on the theoretical preparation of students are increasing, but on the other hand, the time to acquire didactic skills is decreasing. A serious training reform such as school pedagogical practice receives only about 50% of the original lesson subsidy, which increases the discrepancy between theoretical training and school practice (Bielej, 2003).

# Conclusions

The tools defined in the Sport Concept of the Slovak Republic for the years 2022-2026 can serve as starting points for solving the current situation, which support the creation of a

positive relationship of children to physical and sports education and support the movement of residents of all age categories. These include (MSVVM SR, 2022):

- Development of human resources training and development of teachers of physical and sports education, coaches and instructors, sports service providers, volunteers and other workers in sports.
- Development of sports infrastructure it is necessary to ensure conditions for the implementation of safe and motivating physical activities, systematic development of sports infrastructure, especially school sports fields, regional sports infrastructure, active zones and sports infrastructure for all.
- Promotion of an active lifestyle and innovations in sports carry out systematic promotion of sports, media campaigns, support innovative and technological projects in sports, analyse sports data.
- Interdepartmental and inter-sectoral approach cooperation between ministries and other public administration bodies.
- Operation and development of a new sports information system, which will contain all relevant information in digitized form.

Additional possibilities are provided by the application of the Active School concept. It is a concept of the Ministry of Education, Science, Research and Sports, which represents a comprehensive approach to exercise activities at schools, which are implemented by the school before, during or after the end of classes. Individual parts of an active school include, for example, the following activities:

- Active transportation to/from school, which includes all forms of transportation to and from school on foot, by bicycle, on skates, skateboards, or scooters.
- Active school clubs allow children to spend more time in the fresh air and create space for relaxation and socialization of children.
- Active classes students use the corridors, the gymnasium, the schoolyard to spend their breaks actively.
- Sports clubs they can attract a wide range of children to exercise and sports.
- Sports courses the most traditional forms are swimming and skiing courses but there are also other forms of courses and training such as e.g. cycling, climbing course, in-line skating, etc.
- Testing the school participates in the Olympic fitness badge project.
- School sports competitions the offer of competitions takes into account the possibility of participation of the largest number of pupils and does not discriminate against anyone.
- Catering school canteens, buffets, vending machines offer pupils high-quality and healthy food.

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#### Increasing Education for Sustainable Practices to Improve the Management Sports Organizations

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The Barcelona Conference on Education 2024 Official Conference Proceedings

#### Abstract

The article aims to present results oriented towards increasing education for sustainable practices for improving the management of sports organizations. The results are aimed at implementing the lifelong learning program from the point of view of sustainability and increasing the development of sports organizations. Part of the results will highlight the benefits of the conference "Conference Sports Management in Central & Eastern Europe 2024". The meeting will focus on key aspects of strategic sports management in the countries of Central and Eastern Europe. The results are based on the research carried out in 2023 focused on the sustainability of sports organizations in Slovakia as part of the project solution, Sustainability Strategy of a Sports Organization in the Conditions of the Slovak Republic (2021-2024). The survey was used by 177 managers from sports organizations in Slovakia. The benefit of the article is the expansion of the portfolio of forms of training managers in sports organizations not only in Slovakia but also in the world. The article's authors want to participate in developing an interest in acquiring knowledge of sustainable procedures in connection with prevention and risk management in the management of sports organizations.

Keywords: Learning Program, Sports Organizations, Management Improvement, Prevention, Sustainability

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# Introduction

The development of the sports industry is progressing at a tremendous pace. Nevertheless, owners and managers of sports organizations are constantly considering their current business models to be more sustainable and resilient in the diverse current environmental changes. Many global companies, institutions (e.g. Deloitte, 2024; PwC, 2024; Nielsen Sports, 2022), experts (e.g. Portus, 2021; Kees Mons, 2022), and scientists (e.g. Delarestaqi et al., 2024; Baker et al., 2022; Abeza, Sanderson, 2023; Westerbeek et al., 2022; Frevel et al., 2022; Varmus et al., 2022; Furiak, Buganová, 2023) examine the current state, future challenges, opportunities, and growth of the sports market to provide insights into how business in sports will evolve from a management perspective. The general conclusion from the survey data is highly positive and the sports industry is characterized by optimism. According to Deloitte (2024), and PwC (2024), this opinion is shared by several countries of the world, especially the countries of North America, and the Middle East, and several of them agreed that the demand for sports will continue to develop due to the main trends of the current time. Despite the positive trends, sports organizations face various problems, e.g. the changing roles of government, the public sector, the private sector, funding sources, policy development, infrastructure provision, sports governing bodies and federations, and ensuring the integrity of sports. From these stated requirements follows the need to train managers in sports organizations to set up sustainable processes for continuous management improvement (Sports Strategy 2030, 2021).

The article aims to present the results-oriented towards increasing education for sustainable practices for improving the management of sports organizations. The results are focused on implementing a lifelong learning program from the perspective of sustainability and increasing the development of sports organizations. The results highlight the benefits of the conference "Conference Sports Management in Central & Eastern Europe" held on April 22-24, 2024. The conference focused on key aspects of strategic sports management in Central and Eastern European countries. The conference aimed to increase awareness and education in the field of sports management as well as to develop cooperation between important institutions of the sports industry and universities.

To achieve the set aim, methods were used, e.g. analysis of relevant sources, studies, surveys, authors' own experiences, examination and assessment of current approaches, synthesis, modeling of the proposed educational program solution and discussion with experts from the sports industry and academia. The processed results are the output of solving partial tasks of the project implemented in Slovakia.

# 1. Results From the Assessment of the Education of Managers in Sports Organizations in Slovakia

The results are based on the research carried out in 2023 focused on the sustainability of sports organizations in Slovakia as part of the project solution, Sustainability Strategy of a Sports Organization in the Conditions of the Slovak Republic (2021-2024).

A questionnaire survey was carried out as part of the research, in which 177 managers from sports organizations in Slovakia participated. The questionnaire was created by a scientific team dealing with sports management at the Department of Management Theories and the Department of Crisis Management of the University of Žilina in Žilina, Slovakia. The

questionnaire addressed areas from the perspective of financial aspects of club functioning, stakeholders, risks, and their management in sports organizations in Slovakia.

The questionnaire was delivered to all Slovak registered sports clubs via email in Google Forms, with the help of the Slovak Tennis Association and the Slovak Olympic Committee. The population contains approximately 4.7 thousand entities. The target group was the sports managers of these clubs. The questionnaire survey was carried out from February 2024 to March 2024. The number of responses received was 177, which corresponds to a statistical error of 6.06% at a 90% confidence interval. The Cronbach's alpha test was used to assess the internal consistency and reliability of the questionnaire data, the values of which range between 0 and 1. The test result was 0.71, which means that the questionnaire data have high reliability (Boško, 2024).

The questionnaire survey yielded the following findings:

The respondents' highest level of education, Figure 1:

- 37.9 % secondary education,
- 37.9 % university education of the second degree,
- 11.9 % university education of the first degree,
- 11.9 % university education of the third degree,
- 0.5% basic education.



Figure 1: The Respondents' Highest Level of Education

Graduated study field in the field of economics and management of the respondents, Figure 2:

- 72.88 % have not completed a field of study within secondary and higher education,
- 24.86 % have completed a field of study within secondary and higher education,
- 2.26% have completed only basic education.



Figure 2: Graduated Study Field in the Field of Economics and Management of the Respondents

Graduated from any field of study at the Faculty of Physical Education and Sports of the respondents, Figure 3:

- 85.88% have not completed a field of study,
- 14.12% have a completed field of study.



Figure 3: Graduated From Any Field of Study at the Faculty of Physical Education and Sports the Respondents

The activity of the respondents in the current sports club, Figure 4:

- 74.01% have been working in a sports club for 10 years or more,
- 20.34% work in a sports club for 6-10 years,
- 5.65% work in a sports club for 1-5 years.



Figure 4: Activity of the Respondents in the Current Sports Club

The majority of respondents indicated that the roles of manager and coach are not differentiated in their sports club, approximately 59.32% of respondents. This can be explained by the fact that the sample is likely to be small and medium-sized sports clubs, where there may not be a sufficient budget available to pay a separate sports manager and sports coach.

The questionnaire survey reveals other important findings (Boško, 2024; Varmus et al., 2023):

- Sports managers perceive a strong influence of fans on the daily activities of the club. The influence is higher in the case of a football sports manager.
- Sports managers spend high financial expenses on club marketing, which may mean that sports managers have negative experiences with the concept or that these expenses are not used correctly.
- Sports managers attach greater importance to concepts related to members in higher age categories.

- Sports managers do not trust the media, they think that the media do not communicate objectively enough, or do not pay enough attention to their sport, therefore the likelihood of cooperation is reduced.
- Cooperation of a sports club with the media is significantly positively influenced by the amount of income of the sports club. The greater the income, the greater the likelihood of cooperation with the media.
- Sports managers consider athletes and the city/municipality to be the most important stakeholders. Fans, media, or the state are considered unimportant rather than important.
- Sports managers consider the factor of their assumptions to be the most important when deciding on the inclusion of an individual in the group of athletes of a given club.
- Sports managers have an age category of 60 and over.

#### 2. Results From the Realized International Conference

On April 22-24. In 2024, the first year of the SMICEE – Sports Management in Central & Eastern Europe conference took place in Rajecke Teplice (Slovakia). The conference was organized by the Department of Management Theories of FRI UNIZA in cooperation with the president of EASM (European Association for Sport Management). The meeting focused on key aspects of strategic sports management in the countries of Central and Eastern Europe. The conference brought an opportunity to connect research results from Slovakia and colleagues from other parts of Europe, for example: Brunel University London, Leipzig University, University of South-Eastern Norway, and the University of Haag-Helia.

The conference was opened by Assoc. Prof. Ing. Michal Varmus, PhD., presented the main results of more than a decade of research and educational efforts of the team from the Department of Management Theories in this area. Another enriching component was an interactive workshop on the topic of sustainability in sports led by Prof. Vassil Girginov. The connection with the practice of sports management in Slovakia was achieved through the participation of representatives of the Slovak Olympic and Sports Committee and the largest Slovak sports associations (Slovak Football Association, Slovak Ice Hockey Association, Slovak Tennis Association), as well as other important sports organizations. The presented contributions focused on several aspects of sports management, including sustainability, gender equality, the use of ICT, financing, club development, and connections with the smart city concept. For the doctoral students present, it was a unique opportunity to discuss with experts from science and practice, but also to verify their scientific results (Conference SMICEE, 2024).



Figure 5: Participants of the SMICEE – Sports Management in Central & Eastern Europe Conference in Rajecke Teplice, Slovakia on April 22-24, 2024 (Conference SMICEE, 2024)

The whole event was marked by a pleasant and inspiring atmosphere, where participants shared their opinions and perspectives on the topic of sports management, Figure 5. Two social evenings provided an opportunity to establish relationships and future collaborations. The participants themselves expressed positive views during the conference regarding the entire process, as well as the benefits in the form of current research and practically oriented findings. The organizers plan to continue the tradition in the future and make the conference a regular event.

#### 3. Design of the Lifelong Learning Program for Sports Managers

The proposed lifelong learning program is based on the results of scientific and research projects, as well as the results of various current trends, analyses, surveys, both from the perspective of sports management or education issues in Slovakia and around the world. First of all, the profile of a sports manager was defined in terms of his/her competencies, knowledge, skills, and their application in practice.

Profile: A sports manager should be a qualified expert in the field of procedural, material, and personnel management of sports entities. A sports manager should effectively plan and organize sports events at home and abroad, prepare and coordinate marketing and educational activities, develop strategies and projects, monitor and supervise the application of rules and regulations, participate in the management of technical and administrative personnel. A sports manager should ensure activities related to data collection, statistical processing, and administration of sports and economic documentation. He should be able to work in sports clubs, sports associations, regeneration and fitness centers, and other organizations in the field of sports (Sports Manager, 2024; MBA, 2024).

The created lifelong learning program is designed as a one-day workshop, implemented in cooperation between two faculties at the University of Žilina. The main parts of the lifelong learning program from a knowledge perspective include Figure 6:

- 1. Sports management and risk management.
- 2. Facility management and project management.
- 3. Financial management and business in sports.
- 4. Sports marketing and public relations.

- 5. Teamwork and sports ethics.
- 6. Legal aspects of sports.

The main parts of the lifelong learning program from a skills perspective include Figure 7:

- 1. Conceptual skills.
- 2. Technical skills.
- 3. Human skills.
- 4. Social skills.

*The lifelong learning program* offers sports managers a comprehensive overview of important information for increasing the sustainability and development of sports organizations.

*The goal of the proposed learning program* is to increase the qualifications of sports managers by increasing their knowledge base in the field of sports management and acquiring skills for their successful application.

*The form of a learning program* is implemented through presentations, case studies, interactive workshops, teamwork, etc. lasting one day and will provide ample opportunities to learn from the experience of qualified lecturers.



Figure 6: Design of the Lifelong Learning Program for Sports Managers – The Main Parts of the Knowledge Perspective



Figure 7: Design of the Lifelong Learning Program for Sports Managers - The Main Parts of the Skills Perspective

*Target group* - The lifelong learning program is intended for middle and top managers of sports clubs, sports facilities, sports coaches, employees of non-profit organizations, civil servants, but also other experts whose working career is connected with sports. The education will be used by all applicants who wish to gain new knowledge, familiarize themselves with the latest innovations, and thus stay ahead of others.

*The benefit of the program* - Successful graduates of the learning program will gain a significant advantage over others. Graduates will expand their knowledge of the field of sports management and gain new impulses for business, as well as the opportunity to improve their management skills.

#### Conclusion

Sport is a global phenomenon today and sports management education plays a key role in implementing sustainable practices to improve the management of sports organizations. These practices enable organizations to respond more effectively to current challenges and trends in the sports industry. Managers need to understand the international environment, cultural differences, and different regulatory frameworks to be successful, attract audiences, and create international partnerships. Modern tools such as data analysis, artificial intelligence, and digital platforms are significantly changing the way sports clubs are managed. Managers need to know how to use these technologies to improve marketing and fan base. Educated sports managers can develop initiatives that support the sustainability of a sports club, and implement modern business models to maximize profits. With increasing competition between clubs, it is necessary to strategically build a brand, ensure a high level of talent management, and provide an unforgettable experience for fans. Managers must understand how to engage fans through social media, events, and experiences that go beyond the traditional confines of the stadium. Sports organizations have the opportunity to build strong ties with local communities, educational institutions, and partners. Educated managers understand the importance of such collaborations, which strengthen community responsibility and increase long-term support for the club.

*The contribution of the paper* is to expand the portfolio of forms of education for managers in sports organizations not only in Slovakia but also in the world. The authors of the paper want to contribute to raising awareness of the effective management of sports organizations and

their impact on society as a whole. They also want to participate in developing an interest in acquiring knowledge of sustainable practices in connection with the prevention and management of risks in the management of sports organizations.

Investing in the education of sports managers is a way to ensure that sports organizations will not only achieve sporting success but will also be socially responsible and long-term sustainable entities. Managers who understand the principles of sustainability can transform sports clubs into model organizations that inspire other sectors to similar initiatives. This significantly contributes not only to the development of sports but also to building a better future for society.

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# Cultural Mediators in Action: Enhancing Psychological Counseling for International Students Through the PASSI@Unito Project

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#### Abstract

This article examines the critical role of cultural mediation in psychological counseling, focusing on its application in intercultural counseling for international students at the University of Turin, Italy. Drawing on professional clinical experiences from the PASSI@Unito service, the study explores how cultural mediators bridge linguistic and cultural gaps between local psychologists and international students. By analyzing selected clinical examples, the article highlights innovative strategies and practical tools employed by mediators to assist psychologists in understanding the cultural, political, and economic contexts that influence students' behaviors, thought processes, and communication styles. These examples underscore the challenges international students face in academic, social, and everyday settings due to cultural differences, emphasizing the mediators' pivotal role in fostering understanding, trust, and effective support. The findings also reveal the need for comprehensive training programs to enhance the skills of cultural mediators, ensuring the provision of high-quality psychological support for international students. Concluding with actionable recommendations, the article advocates for targeted training initiatives and improved strategies to promote culturally sensitive and effective psychological services in intercultural contexts.

Keywords: Cultural Mediation, International Students, Psychological Counseling

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# Introduction: Research Context and Rationale

The increasing global mobility of students has transformed university campuses into multicultural environments, advancing the internationalization of higher education. While this phenomenon fosters cultural exchange and intellectual growth, it also poses unique challenges, particularly for the mental health and psychological well-being of international students. These students often face cultural, linguistic, and social barriers that complicate their adjustment to host countries, intensifying feelings of isolation, stress, and alienation (Arthur, 2017). Such challenges are especially pronounced in university settings, where academic pressures, cultural dissonance, and language difficulties intersect, creating a complex web of stressors that require specialized support.

Traditional psychological counseling often fails to address the specific cultural nuances that shape international students' experiences. Counseling frameworks rooted in Western paradigms tend to prioritize individualism, self-expression, and autonomy, which may not align with the cultural values of students from collectivist or non-Western societies (Leong & Kalibatseva, 2011). Without culturally sensitive interventions, counseling services risk being ineffective or even counterproductive, leaving international students underserved.

To address these gaps, cultural mediation has emerged as a transformative practice in psychological counseling. By bridging linguistic and cultural divides, cultural mediators enable counselors to provide empathetic and contextually relevant support, fostering mutual understanding and facilitating effective therapeutic outcomes. This article explores the concept, role, and significance of cultural mediation, with a focus on its transformative potential for international students in Italy.

#### Theoretical Background of Cultural Mediation

Cultural mediation is rooted in the broader principles of intercultural communication and sociocultural adaptation, offering a structured approach to bridging cultural gaps between individuals from diverse backgrounds. The concept originated in the mid-20th century within fields such as anthropology and sociology, where scholars began recognizing the need for intermediaries to facilitate understanding in culturally diverse contexts (Bennett, 1998). Early applications of cultural mediation were primarily in conflict resolution and immigrant integration, but the practice has since expanded into education, healthcare, and psychological counseling.

Cultural mediators serve as intermediaries who translate not only language but also the cultural values, norms, and behaviors that underpin communication and interaction. Unlike traditional translators, mediators provide contextual interpretations that help individuals from different cultural backgrounds understand each other more deeply. Their work is grounded in theories of intercultural competence, which emphasize the ability to navigate cultural differences effectively by developing awareness, knowledge, and skills (Byram, 1997).

In psychological counseling, cultural mediation has gained prominence as a strategy for addressing the complexities of intercultural therapy. Research highlights its dual role in improving access to services and enhancing the quality of therapeutic interactions. Mediators help counselors grasp the socio-cultural and political contexts shaping clients' experiences, while also empowering clients to articulate their concerns in culturally resonant ways (Baim & Guthrie, 2014). This approach not only fosters mutual understanding but also mitigates the risk of cultural misunderstandings that can undermine therapeutic outcomes.

#### Cultural Competence and the Role of Mediation

At the heart of effective intercultural counseling lies cultural competence, a fundamental skill set for professionals working with diverse populations. Cultural competence is defined as the ability to understand, communicate with, and effectively interact across cultural boundaries. It encompasses three critical components: cultural awareness, knowledge, and skills, which enable counselors to recognize and address cultural influences on clients' behaviors, emotions, and perceptions (Sue & Sue, 2013, p. 25). These competencies allow counselors to tailor their interventions, creating therapeutic environments that are inclusive and responsive to the needs of diverse populations.

However, achieving cultural competence is not without challenges. Most counseling frameworks are deeply rooted in Western psychological theories, which may overlook culturally specific behaviors and expressions of distress. For example, clients from non-Western societies may somatize psychological distress, expressing emotional pain through physical symptoms, or prioritize familial obligations over individual well-being (Kleinman, 1988, p. 14). Such cultural differences, if misunderstood, can lead to misdiagnoses and ineffective interventions, underscoring the need for complementary strategies like cultural mediation to bridge these gaps.

Cultural mediation provides a framework for addressing these complexities. It is particularly valuable in navigating differences in communication styles, culturally specific expressions of distress, and varying expectations of the counseling process. Clients from high-context cultures, such as many Asian societies, often rely on indirect communication and nonverbal cues, which may be misinterpreted by counselors accustomed to low-context, direct communication styles (Hall, 1976, p. 91). By offering critical interpretations, mediators help counselors understand the socio-cultural and political contexts influencing clients' experiences. This dual facilitation ensures that counseling sessions are both linguistically accessible and culturally attuned, enhancing mutual understanding and therapeutic efficacy (Baim & Guthrie, 2014, p. 34).

# Specific Challenges Faced by International Students in University Settings

International students encounter a complex array of challenges that can significantly affect their mental health, academic success, and overall well-being. These challenges are deeply interconnected, often stemming from cultural, linguistic, and educational differences that complicate their adjustment to university life in a foreign country.

One of the most pervasive issues is the language barrier, which frequently limits international students' ability to express their thoughts and feelings effectively (Arthur, 2017). This challenge extends beyond academic settings, as limited language proficiency can hinder their engagement with peers, instructors, and mental health professionals. For instance, students may struggle to articulate their emotional distress in a second or third language, leading to feelings of frustration, isolation, and being misunderstood.

Cultural differences significantly amplify the challenges faced by international students in navigating unfamiliar educational systems and societal norms. These difficulties often stem

from fundamental mismatches between cultural values and academic expectations. For instance, Western academic settings typically prioritize active participation, independent thinking, and critical questioning as markers of academic engagement and success (Smith & Khawaja, 2011). However, students from cultures emphasizing hierarchical deference, collective harmony, and respect for authority may find these norms unfamiliar or uncomfortable (Hofstede, 1986; Gu, Schweisfurth, & Day, 2010). As a result, their behavior may be misinterpreted as disengagement or lack of motivation, when, in fact, it reflects deeply ingrained cultural frameworks and communication styles.

Moreover, cultural adjustment can impact not only academic participation but also interpersonal interactions. Research highlights that international students often struggle with forming social connections in host countries due to cultural and linguistic barriers (Ward, Bochner, & Furnham, 2001). These challenges underline the need for institutions to adopt culturally responsive approaches to support international students, recognizing the diversity of their experiences and needs.

Social isolation and discrimination exacerbate these challenges, contributing to a profound sense of alienation. Many international students report difficulties in building meaningful relationships with local peers, who may perceive them through cultural stereotypes or fail to appreciate the complexities of their experiences. Instructors and mental health professionals, similarly, may lack the cultural awareness needed to effectively support these students, reinforcing feelings of being misunderstood or marginalized. These experiences highlight the urgent need for culturally sensitive interventions, such as cultural mediation, to create inclusive and supportive environments.

# Research Insights From the Practical Model of the PASSI@Unito Project

This study is grounded in the professional clinical experiences of the PASSI@Unito project, a psychological counseling service designed to support international students at the University of Turin since 2019. Central to its methodology is the integration of cultural mediation, which serves as both a theoretical and practical innovation in addressing the multifaceted challenges faced by international students. These challenges—arising from linguistic barriers, cultural dissonance, and the pressures of adapting to unfamiliar academic and social environments—demand interventions that are both tailored and culturally sensitive.

The PASSI@Unito project draws on theoretical frameworks of cultural competence, intercultural communication, and transcultural psychiatry. As Beneduce (2010) emphasizes, transcultural approaches in mental health prioritize an understanding of the historical, social, and political forces that shape individuals' experiences and suffering. Cultural mediation, a cornerstone of the PASSI project, operationalizes this perspective by situating the therapeutic encounter within the broader socio-cultural and political contexts of the students' lives. This aligns with Taliani's (2018) work on the "poetics of suffering", which underscores the importance of interpreting individual distress within culturally embedded narratives.

The project also incorporates insights from Sue and Sue's (2013) model of cultural competence, which advocates for counselors' awareness, knowledge, and skills to address cultural influences on their clients' behaviors and concerns. Intercultural communication theories, such as those by Hall (1976), inform the understanding of high-context versus low-context communication styles—an area where cultural mediation proves invaluable in

preventing misinterpretations. Mediators function as bridges, not merely translating language but also interpreting cultural codes and contextual meanings, thereby enriching the therapeutic process.

Through ethnographic observations, semi-structured interviews, and detailed case studies, this research captures the transformative role of cultural mediation in enhancing counseling outcomes. One illustrative case involved a Chinese student whose hesitation to participate in class discussions was initially perceived by counselors as disengagement. Drawing on insights from Confucian cultural values, the mediator explained the student's deference to authority and preference for reflection over immediate response. This reframing helped the counselor adopt a culturally informed approach, fostering greater empathy and enabling the student to engage more confidently in academic settings.

Beneduce's (2016) notion of "displacement of suffering" resonates with the PASSI approach, as cultural mediation acknowledges and addresses the impact of migration, isolation, and systemic inequalities on students' mental health. Mediators provide critical socio-cultural interpretations that deepen counselors' understanding of the intersecting factors influencing students' experiences. This aligns with Arthur's (2017) findings that culturally attuned counseling reduces feelings of alienation and fosters a sense of belonging, which are critical to the mental health and academic success of international students.

By integrating cultural mediation into its practices, the PASSI@Unito project not only addresses linguistic and cultural barriers but also challenges traditional counseling models that may inadvertently marginalize non-Western perspectives. This article contributes to the broader discourse on intercultural counseling by critically analyzing the successes and challenges of the PASSI@Unito project. It offers a model for institutionalizing cultural mediation as a standard component of psychological support in multicultural university settings. The findings highlight the transformative potential of mediation in fostering equity, inclusivity, and efficacy in counseling practices while addressing the diverse needs of international students.

# **Cultural Mediation: Bridging Theory and Practice in Psychological Counseling**

Cultural mediation is a dynamic, practice-oriented approach that addresses the complexities of cultural diversity in psychological counseling. It bridges gaps arising from cultural and linguistic differences, ensuring that services are accessible and culturally responsive. Mediators play a crucial role in fostering trust, understanding, and therapeutic effectiveness by navigating the intricacies of intercultural dynamics.

As Byram (1997) and Sue and Sue (2013) emphasize, cultural competence extends beyond awareness of differences to actively negotiating values and behaviors for shared understanding. This is vital in overcoming systemic barriers and communication challenges, particularly for international students and other culturally diverse populations. Research indicates that fostering such understanding promotes trust and engagement, key factors for effective therapy (Arthur, 2017).

Cultural mediation integrates these principles into a practical framework, aligning counseling methods with clients' cultural contexts. Mediators address divides in communication styles, expressions of distress, and behavioral norms. Grounded in theories such as Hall's (1976)

high- and low-context communication model, mediation helps counselors interpret implicit cultural codes, enhancing mutual understanding.

Additionally, mediation addresses culturally specific phenomena like the somatization of distress, common in collectivist cultures where emotional struggles manifest as physical symptoms (Kleinman, 1988). Mediators provide insights into these expressions, enabling culturally adaptive interventions that validate diverse experiences of distress (Leong, Eggerth, & Chang, 2017).

Effective mediation also requires critical reflexivity to avoid essentializing cultural practices. Cultural identities are fluid and shaped by multiple factors. Mediators must remain sensitive to this complexity, ensuring their interpretations respect the diversity of individual experiences (Hansen & Sassenberg, 2020).

By bridging cultural and linguistic divides, cultural mediation fosters inclusivity and understanding, enhancing therapeutic outcomes and advancing equitable mental health services.

# Cultural Contextualization as a Relational Tool

Cultural contextualization plays a vital role in bridging the gap between counselors' expectations and students' culturally rooted behaviors. For instance, in a counseling session involving a Chinese student who was reluctant to discuss familial conflicts, I explained that this behavior reflected Confucian values prioritizing filial piety and family harmony (Huang, 2022). This cultural insight allowed the counselor to create a non-confrontational environment, encouraging the student to engage more openly. While this approach aligns with Sue and Sue's (2013) emphasis on cultural awareness and skill development, it also raises critical questions about the delicate balance between respecting cultural values and fostering self-expression within the therapeutic process. This tension underscores the need for mediators to facilitate a dynamic interplay between cultural validation and therapeutic goals.

# High-Context vs. Low-Context Communication: Moving Beyond Simplification

Hall's (1976) framework of high- and low-context communication remains a valuable tool for understanding diverse communication styles but has faced criticism for oversimplifying individual experiences. High-context communication, often associated with Asian cultures, emphasizes nonverbal cues, indirectness, and reliance on shared cultural understanding. These tendencies often reflect cultural values such as humility and deference to authority (Giri, 2020). For instance, in one case, I explained to an Italian counselor that a Chinese student's minimal verbal feedback did not indicate disengagement but rather stemmed from these cultural norms. This insight allowed the counselor to adopt a more empathetic and culturally sensitive approach, enhancing the therapeutic relationship.

However, generalizations about communication styles must be approached with caution. Byram (1997) and more recent scholarship (Holliday, 2018) stress the need to recognize cultural tendencies as fluid and context-dependent rather than fixed. Individuals often navigate and adapt to multiple cultural frameworks, and over-reliance on broad categorizations risks essentializing identities and perpetuating stereotypes. Instead, a nuanced understanding of the interplay between cultural norms and individual agency is essential for effective intercultural communication in counseling settings.

# **Decoding Cultural Expressions of Distress**

Cultural expressions of psychological distress often deviate significantly from Western norms, requiring mediators to interpret culturally specific manifestations. In collectivist cultures, emotional pain is frequently somatized, appearing as physical symptoms. Research has documented this phenomenon extensively, emphasizing the role of cultural factors in shaping how distress is expressed and understood (Kirmayer et al., 2001; Ryder et al., 2008). For instance, during a session with a Middle Eastern student reporting chronic headaches, I collaborated with the counselor to uncover underlying emotional stressors while addressing the cultural stigma surrounding mental health discussions. This approach aligns with Kirmayer's (2004) work on explanatory models, which stress the need for culturally informed understandings of illness.

Such culturally specific expressions of distress challenge counselors to adapt their therapeutic frameworks. Effective interventions must incorporate these cultural dynamics while ensuring inclusivity and maintaining therapeutic rigor. Integrating insights from cultural psychiatry (Kirmayer & Ban, 2013) helps bridge the gap between culturally influenced expressions of distress and effective psychological care.

# Navigating Linguistic and Emotional Landscapes

Effective communication in intercultural counseling transcends literal translation, requiring mediators to navigate the cultural subtext and emotional nuances embedded in student expressions. Approaches such as dual-layered translation and narrative sharing exemplify how mediators create inclusive therapeutic environments that honor cultural diversity.

In dual-layered translation, mediators go beyond the literal meaning of words to preserve their emotional and cultural significance. For instance, a Middle Eastern student described academic challenges using culturally specific metaphors. Literal translation would have stripped these metaphors of their emotional depth, potentially alienating the student. By providing contextual interpretations, I ensured that the counselor grasped the full significance of the student's concerns. This practice resonates with Baim and Guthrie's (2014) emphasis on mediators as cultural interpreters, while also raising critical questions about the mediator's role in shaping the therapeutic narrative, particularly in maintaining neutrality and avoiding over-interpretation.

Narrative sharing, another key strategy, empowers students to articulate their concerns within their cultural frameworks, fostering deeper connections with counselors. Arthur (2017) underscores the therapeutic value of storytelling, which not only validates students' experiences but also provides counselors with insights into the cultural pressures shaping their distress. For example, a South Asian student's narrative about familial expectations illuminated the collectivist values influencing their anxiety, enabling the counselor to tailor their interventions accordingly. However, this approach also necessitates careful navigation of the ethical tension between cultural validation and the potential imposition of Western therapeutic norms, particularly in contexts that prioritize individual autonomy.

# Building Trust Through Cultural Sensitivity

Trust forms the cornerstone of effective counseling, particularly for students from cultures where mental health discussions are stigmatized (Sue & Sue, 2013). Mediators play a crucial

role in fostering this trust by guiding counselors to demonstrate cultural sensitivity and validate students' practices. For instance, in working with a Chinese student who relied on traditional healing methods, I encouraged the counselor to acknowledge and integrate these practices into the therapeutic dialogue. This approach aligns with Hall's (1976) emphasis on understanding cultural context while critiquing Western-centric counseling models that may marginalize alternative health perspectives. By bridging these gaps, mediators contribute to creating therapeutic environments where students feel respected, valued, and understood.

#### **Cultural Mediation in Practice**

Cultural mediation plays a vital role in psychological counseling by bridging linguistic and cultural gaps, facilitating effective communication, and fostering mutual understanding. The following cases illustrate the difficulties and predicaments faced by international students due to cultural and language barriers. They also demonstrate how targeted mediation strategies can resolve these challenges, highlighting the essential role of cultural mediators in promoting inclusive and effective counseling practices.

#### **Example 1: Misinterpreted Silence**

The Chinese student in this case encountered a significant communication barrier stemming from cultural differences in communication styles. Silence, often misunderstood in Western contexts as disengagement or disinterest, is a common communication feature in many East Asian cultures. It can signify respect, thoughtfulness, or a need for reflection rather than avoidance or lack of participation. The counselor's interpretation of the student's silence as disengagement risked alienating the student and undermining the therapeutic relationship, creating a barrier to effective counseling.

As a cultural mediator, understanding the high-context communication style typical of East Asian cultures was essential. I explained to the counselor that in such contexts, silence often carries positive connotations, reflecting careful consideration or deference to authority. This reframing of silence allowed the counselor to approach the sessions with greater cultural sensitivity.

To foster engagement, I suggested the counselor to use open-ended questions that provided the student with opportunities to reflect and respond without the pressure of immediate articulation. Additionally, encouraging longer pauses after questions allowed the student to process information at their own pace. Over time, these strategies created a more comfortable and inclusive environment, enabling the student to share their concerns more openly. This case underscores the need to adapt counseling practices to accommodate high-context cultural norms, challenging the Western paradigm that equates verbal articulation with active participation.

# **Example 2:** Academic Pressure and Cultural Expectations

The South Asian student in this scenario faced intense anxiety related to career decisions, deeply rooted in familial expectations and cultural norms prioritizing collective success. In collectivist societies, such as those prevalent in South Asia, family often plays a central role in shaping individual goals and aspirations (Hofstede, 2011). The student struggled to reconcile these expectations with their personal aspirations, creating a significant source of stress. The counselor's initial focus on encouraging individual autonomy—an approach

aligned with Western therapeutic models—risked alienating the student by failing to align with their cultural values.

The mediation process began by contextualizing the student's concerns within their cultural framework. I explained the importance of family in South Asian cultures, where career choices are often seen as collective decisions rather than purely individual ones. This cultural insight helped the counselor shift their focus from solely promoting individual autonomy to exploring solutions that integrated familial input.

Narrative sharing, as recommended by Arthur (2017), was employed to help the student articulate their experiences and pressures. The student was encouraged to share their story, highlighting their family's expectations and their own aspirations. This narrative approach not only validated the student's experiences but also provided the counselor with critical insights into the cultural dimensions of the student's anxiety.

By integrating the family into the counseling process—such as discussing ways to involve them in career planning without compromising the student's personal goals—the counselor was able to align therapeutic interventions with the student's values. This approach demonstrated the importance of adapting counseling practices to reflect collectivist worldviews, addressing systemic gaps in Western-centric frameworks.

# **Example 3:** Addressing Cultural Distance

The Middle Eastern student in this case struggled with both linguistic and cultural barriers, making it difficult to articulate frustrations over perceived academic bias. The student's limited proficiency in Italian compounded the issue, as they were unable to fully express their concerns. Additionally, cultural values emphasizing fairness and respect were central to the student's dissatisfaction but were not immediately apparent to the counselor. This situation reflects the challenges of cultural distance, where differences in cultural frameworks can create misunderstandings and feelings of alienation (Guo & Chase, 2011).

As a mediator, my role involved translating not only the student's language but also the cultural subtext underlying their concerns. This dual-layered translation approach ensured that the student's values and emotions were accurately conveyed to the counselor. By contextualizing the student's frustrations within their cultural emphasis on fairness and respect, I helped the counselor understand the deeper significance of the student's grievances.

The counselor was then able to validate the student's experiences, addressing their concerns with empathy and collaboratively exploring strategies to mitigate academic bias. This included discussing institutional policies and advocating for fair treatment within the academic setting. The mediation process also helped the student feel seen and supported, reducing their sense of alienation.

This case highlights the importance of addressing both linguistic and cultural barriers in counseling. It underscores the need for systemic changes within host institutions to reduce cultural distance and promote equity for international students.

#### **Impact of Cultural Mediation on Counseling Practices**

Cultural mediation serves as a bridge to address the challenges posed by cultural diversity in psychological counseling, particularly for international students. It integrates cultural, linguistic, and systemic elements into therapeutic practices, significantly enhancing the quality of interactions and fostering inclusive counseling environments. By promoting mutual understanding and creating culturally responsive spaces, cultural mediation contributes to the psychological well-being of students while empowering counselors to adapt their approaches effectively. However, its transformative potential also underscores systemic barriers that must be addressed for its broader implementation.

#### Enhancing Student Well-being

Cultural mediation plays a critical role in helping international students feel validated, understood, and empowered within counseling contexts. By integrating cultural insights into therapeutic interactions, mediation ensures that students' cultural identities and unique experiences are respected. For instance, a Chinese student described feeling "understood in a way that respects my culture" during a mediated session, alleviating their anxiety and fostering engagement. This aligns with Sue and Sue's (2013) emphasis on cultural competence, which highlights the importance of integrating cultural awareness, knowledge, and skills into counseling to enhance therapeutic efficacy. Furthermore, Leong et al. (2017) underscore that culturally tailored interventions reduce barriers to mental health services, fostering trust and engagement.

Mediation also addresses culturally specific expressions of psychological distress, such as the somatization of emotional pain common in collectivist cultures (Kleinman, 1988). By helping counselors interpret and respond to such culturally grounded behaviors, mediators create therapeutic environments that validate students' cultural frameworks while addressing their mental health concerns.

#### **Empowering Counselors Through Adaptation**

Cultural mediation enhances counselors' abilities to navigate cross-cultural dynamics, equipping them with the tools to engage effectively with diverse clients. Mediators provide cultural contextualization, offering counselors insights into the norms, values, and behaviors shaping students' interactions. For example, understanding the Confucian emphasis on filial piety enables counselors to approach East Asian students' reluctance to discuss familial conflicts with greater sensitivity (Huang, 2022). This practice aligns with Byram's (1997) model of intercultural competence, which highlights the dynamic process of negotiating meaning in cross-cultural interactions.

Qualitative feedback indicates that counselors working alongside mediators feel more confident in addressing the complex needs of international students. This is supported by Baim and Guthrie's (2014) assertion that mediators act as bridges across cultural divides, enriching the therapeutic alliance. Additionally, the integration of cultural humility—a framework emphasizing openness, self-awareness, and a commitment to learning from clients—further strengthens the therapeutic process (Hook et al., 2017).

# Narrative Sharing and Cultural Understanding

Narrative sharing is a pivotal strategy in cultural mediation, allowing clients to articulate their experiences within their cultural frameworks. This approach fosters rapport and mutual understanding, providing counselors with critical insights into the cultural pressures and values influencing students' well-being. For example, a South Asian student's narrative about familial expectations illuminated the collectivist values shaping their anxiety, enabling the counselor to tailor interventions accordingly. Arthur (2017) emphasizes the transformative potential of storytelling in therapy, noting its role in fostering culturally attuned counseling practices.

However, integrating narrative approaches requires careful navigation to avoid imposing Western therapeutic norms on collectivist frameworks. Hansen and Sassenberg (2020) caution against oversimplified interventions, advocating for context-specific approaches that address the nuanced interplay of individual and cultural factors.

#### Systemic Barriers and Challenges

Despite its benefits, cultural mediation faces systemic challenges that limit its full integration into counseling practices. Institutional resistance, resource limitations, and reliance on Western-centric models often undermine its implementation. For instance, while a Middle Eastern student felt validated through mediation, their frustrations with academic bias highlighted broader systemic inequities beyond the scope of counseling. Guo and Chase (2011) similarly identify cultural distance and institutional biases as significant barriers for international students.

Reliance on mediators can also inadvertently shift the responsibility for cultural adaptation solely onto the mediator, rather than fostering shared accountability among all stakeholders. Addressing these challenges requires embedding cultural mediation into institutional policies, enhancing counselor training in cultural competence, and developing robust support structures for international students.

# Conclusion

This study has explored the critical role of cultural mediation in psychological counseling, particularly through the PASSI@Unito project at the University of Turin, in addressing the complex needs of international students. By bridging linguistic and cultural divides, cultural mediation fosters mutual understanding, enhances therapeutic outcomes, and creates inclusive counseling environments. Grounded in theories of cultural competence (Sue & Sue, 2013) and intercultural communication (Byram, 1997), cultural mediation extends these frameworks by integrating innovative strategies such as cultural contextualization, dual-layered translation, and narrative sharing. These approaches align with Beneduce's (2016) emphasis on understanding the socio-political dimensions of suffering and Taliani's (2018) focus on the poetics of distress, allowing counselors to engage deeply with the nuanced realities of clients' lived experiences and cultural identities.

The case studies analyzed underscore the transformative impact of mediation, from addressing cultural misinterpretations to empowering counselors to adapt their practices to diverse cultural frameworks. These interventions not only improve students' psychological well-being but also address systemic barriers such as language challenges, cultural distance, and institutional inequities (Guo & Chase, 2011; Hansen & Sassenberg, 2020). By fostering culturally sensitive support systems, cultural mediation contributes to reshaping counseling practices to better serve diverse populations and dismantling the structural inequalities that shape students' experiences (Beneduce, 2010).

However, challenges such as institutional resistance, resource limitations, and unconscious biases persist and must be addressed to maximize the potential of cultural mediation. Beneduce (2016) and Taliani (2018) caution against essentializing cultural identities, emphasizing the need for critical reflexivity and context-specific approaches. Future research should examine the long-term impacts of cultural mediation on individual and institutional outcomes, employing mixed-methods approaches to capture its multidimensional effects. Moreover, developing standardized training programs and embedding cultural competence in counselor education are essential steps for institutionalizing these practices effectively.

Cultural mediation is a vital tool in promoting equitable and responsive mental health services for international students. By honoring the diversity of student experiences and fostering inclusive therapeutic environments, cultural mediators play a pivotal role in addressing the growing global demand for culturally attuned counseling practices. Their work resonates with Beneduce's (2010) call for transcultural approaches that situate suffering within its historical and social contexts, ensuring that counseling practices remain both ethical and transformative in increasingly multicultural settings.

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# Further Development of Framework Training for Managers in the Field of Risk Management According to the Requirements of Sports Clubs

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#### Abstract

Given the current state of the sports market and the risks posed to sports clubs, it is necessary to find ways to provide managers with adequate training to deal with these influences and factors. To this end, a modular training framework for sports club managers has been developed and presented based on the specificities of the environment. Based on the requirements of sports clubs, the main objective of this paper is to optimize this proposed framework in order to best meet their needs, to make it as addressable as possible and to make its integration into practice as effective as possible. In order to achieve the set objective, the methods of empirical research, inquiry and statistical evidence were used. For this purpose, a questionnaire survey was conducted to identify the most significant threats and resulting risks that sports organisations in Slovakia face most frequently in their operational practice. Using statistical research methods, the obtained data were analysed and specific conclusions were drawn about which factors represent the most significant threats to sports clubs. Based on the findings, our proposed modular framework for the professional education of sports managers was optimised to best meet the specific requirements of sports clubs. The main contribution lies in the correction and optimisation of the proposed framework so that sports clubs are able to make the most of the targeted training of sports managers. By focusing on the area of risk management, they will be able to effectively build high levels of resilience and sustainability.

Keywords: Optimalization, Risk Management, Sport Managers, Education, Risks

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#### Introduction

Today's highly globalised world is increasingly influenced by local, regional and even global threats. This brings with it a range of risks that have the potential to fundamentally disrupt the trade and supply relationships that underpin the economies of the developed world. Business risk can take many forms and typically carries with it an increased vulnerability/exposure to disruption arising from the configuration of the organization (Gibb et al., 2006; What, 2020). One of the hallmarks of the rapid development of the economy and society is the development of new types and sectors of business activity. In this context, sporting entrepreneurship gradually came to the fore. Sport itself and the rise in its popularity can be regarded as one of the phenomena of our time. Sporting activities have a strong social and cultural context and the status and importance of sport can be viewed from a number of perspectives. Leisure-time sporting activities have an important place in maintaining an optimal level of physical and mental health in a wide range of the population or in building and maintaining interpersonal relationships.

The sports club and sports business environment is currently undergoing rapid changes and challenges that have a major impact on its future functioning and survival. Current trends in the sports business are causing the sector to become an important part of the national economy. Within the Slovak Republic there are currently 427 068 registered natural persons active in the sports sector. This register includes amateur athletes, professional athletes as well as sports professionals or club officials. Considering the employment in the national economy, which in the second quarter of this year amounted to 2 601 200 natural persons, it is possible to state the considerable size of the sports sector and its importance in the creation of supply chains and economic relations in the country (Buganová et al., 2022; Brutovský et al., 2022; Register, 2024; Zamestnanosť, 2024).

In terms of legal entities (organizations), the current number of registered entities is 7749. A significant factor in this sector has been the impact of the COVID-19 pandemic, which has crippled the entire sports sector and caused significant losses in this area. However, the sports sector has shown a high capacity to recover, showing a 7% growth in the number of registered organisations in the 9 months following the end of this crisis. This is both an indication of the high popularity of sport amongst the broader social strata and its ability to continue to develop (Zamestnanosť, 2024; Register, 2024).

One way to ensure the resilience and sustainability of sports clubs is to integrate an optimized risk management framework and selected elements of business continuity management (BCM) into club structures (What, 2020). BCM is a management discipline that sets out measures to ensure the long-term resilience of an entity through a defined framework. Incorporating these elements with a sports club's BCM system would contribute to improved performance while building a systematic approach to the organisation and the use of resources and reserves. Another important element in the context of global crises is crisis management and risk management systems. These systems have already proven their worth in ensuring the resilience of various organisations and current global trends are leading to their optimisation and wider integration into the sports business segment (What, 2020; Chandak et al., 2022; Furiak et al., 2024; Vasović et al., 2022; Riglietti, 2022). Crisis management, risk management and BCM are considered as key tools to enhance resilience and protect against various crisis situations as well as human errors (Bajgorić et al., 2022).
#### **Current Situation in Sports Clubs in Slovakia**

In order to investigate the current needs of sports clubs in Slovakia in the field of risk management, a questionnaire survey was conducted. The population includes approximately 4.7 thousand entities. Responses were collected from the beginning of February 2024 to March 2024. The resulting statistical sample consisted of 177 responses from sport entities. The data obtained showed a statistical error of 6.06% at the 90% confidence interval. When examining internal consistency and reliability through Cronbach's alpha test, the result took the value of 0.71.

Investigating the existence of a relationship focuses on identifying the presence of a relationship between variables and its statistical significance. For this purpose, the Pearson chi-square test of independence is used, which compares the observed frequency with the expected frequency. In this study, the significance level was set at p < 0.05. The Pearson chi-square test of independence was used to examine the relationship between the size of the club and its differentiation between manager and coach positions (Komendátová et al., 2018; Ostertagová, 2011).

Hypothesis testing involves examining the strength of the relationship between variables, assuming that a statistically significant relationship has already been established between them. Cramer's V and Pearson's contingency coefficient were used for this purpose (Komendátová et al., 2018; Luha, 2007; Titko et al., 2021). Pearson's contingency coefficient was used to assess the strength of the contingency relationship between variables based on qualitative traits. It can take values from 0 to 1 and their interpretation is as follows (Miery, 2023):

- A value of 0 complete independence between the traits.
- A value of 1 complete dependence between the traits.

Cramer's contingency coefficient V is used to determine the appropriate degree of contingency between two qualitative statistical features. Its values range from 0 to 1 and are interpreted as follows (Miery, 2023):

- A value of 0 no relationship between the statistical features.
- A value of 1 a perfect relationship between the statistical features.

## Results of Statistical Research

From the data collected in the research, 5 indicators relevant to the topic of this study were compiled:

- clubs' vulnerability rates to selected factors,
- the clubs' approach to environmental changes,
- the degree of influence of selected stakeholders on clubs,
- indicators of the level of formal education of club managers,
- the relationship between club size and the distinction between the position of coach and manager.

The degree to which clubs are threatened by the selected factors was examined through managers' responses, where they assigned values to the factors they selected ranging from 1 (very low degree) to 5 (very high degree) based on how their club evaluates the threats from these factors. Clubs ranked economic factors and organizational factors as the most

significant threats, while they ranked threats from marketing factors as the least significant. The summary results are shown in Figure 1.



Figure 1: Clubs' Vulnerability Rates to Selected Factors

When examining the clubs' approach to environmental change as a source of potential risks and threats, club managers selected from pre-packaged responses. Based on the results, it was found that the most prevalent approach is based on flexible response to environmental changes, which is applied by 64.97% of clubs. On the other hand, the least frequent approach is planning for preventive measures, which was included by only 14.12% of the clubs. This shows, among other things, the significantly low implementation rates of risk management elements in the environment of sports clubs in Slovakia. The summary results are shown in Figure 2.



Figure 2: Clubs' Approach to Environmental Change

*The degree of stakeholder influence* is an important indicator influencing both the external and internal functioning of the club. In this matter, club managers responded by rating the influence of predefined stakeholder groups on a scale of 1 (very low influence) to 5 (very high influence). Based on the results, it can be concluded that clubs attribute the highest influence to their own members and athletes. On the contrary, the lowest influence is considered to be by the government and the state. The summary results are presented in Figure 3.



Figure 3: The Degree of Influence of Selected Stakeholders on Clubs

When examining the indicators of the level of formal training of club managers, the responses were divided into four categories:

- faculty of Physical Education and Sport,
- managerial or economic secondary or higher vocational education,
- other secondary or higher education,
- basic education.

Based on the results, it can be stated that the most numerous group is other secondary or higher vocational education (58.76%) and the least numerous group is primary education (2.26%). However, graduates of the Faculty of Physical Education and Sport represent only 14.12% of sports club managers. Based on these findings, there is a need to adapt the educational program to the requirements of different types of managers' qualifications, the vast majority of whom do not come from a sport or management background. The summary results of this question are presented in Figure 4.



Figure 4: Indicators of the Level of Formal Education of Club Managers

The last part of the survey was to *test the hypothesis that smaller clubs tend to merge functions and that club managers also act as sports coaches*. This hypothesis was tested by applying the statistical methods described above to data relating to the size of clubs (by number of members) and the merging of managerial and coaching roles in clubs. From the data collected, a contingency table was constructed and the statistical methods described in the previous section were applied (Table 1).

	Table 1: Contingency Table for Hypothesis					
		Average monthly number of members				
		1 to 10	11 to 50	51 to 100	101 to 200	201 to 450
ng the ons of ager ainer	Yes	6	35	22	2	8
Mergi functi man and tr	No	15	57	19	9	4

Pearson Chi-Quadrat	$\chi 2 = 10,0029$
Critical value Chi-Quadrat	9,4877
Value p	$\rho = 4,038E-03$
Cramer's contingency coefficient	V = 0,1189
Pearson's contingency coefficient	<i>C</i> = <i>0</i> , <i>2313</i>

Based on the analysis, it can be confirmed that there is a statistically significant relationship between the variables. Based on the calculation of the degree of association, a weak dependence was found. Thus, the results suggest that there is a weak relationship between club size and the merging of manager and coach roles, and there are other factors that influence this. These findings are shown in Figure 5.



Figure 5: The Relationship Between Club Size and the Distinction Between the Position of Coach and Manager

#### Significant Risk Factors in Sports Clubs in Slovakia

The ability to categorize and describe the risk areas of sports clubs is a necessary step for the effective optimization of the educational framework of managers. To this end, based on the above statistical outputs, empirical research of the literature and publications of other authors, a typology of sport risks in the form of a Risk Grid was developed. The Grid is primarily based on a map of the relationships between environmental components, risk factors, domains and sports club, and attempts to reflect the current situation of clubs in a specific time interval. The main purpose of this is for practical use in creating individual risk categories depending on their origin. The origin of each risk is based on a standardised view based on the identification of a key factor area in a particular component of the organisation's environment. The sport risks grid is based on the sport risk classification framework by Shrivastava and Mitroff. Their framework classifies risk based on the origin in the internal or

external environment of the organisation and the domain that generates the risk. The authors defined two main areas of risk generation:

- Technical,
- Social (Beech et al. 2013).

The strength of this system was its focus on the creation of scenarios involving the joint action of a larger cluster of risks. This approach appears to be more efficient in terms of time and resource allocation compared to focusing on individual risks separately (Beech et al. 2013).

Due to the complexity of the environment of sport organizations and the dynamic evolution of the factors that act in it, the current network of identification and categorization of sport risks develops the system of classification of sport risks by the authors mentioned above. Instead of two basic components of the sport environment, it focuses on three components, thereby distinguishing between risks of the near and far external environment. It develops the original two areas of risk factors into five basic areas. These areas are assigned to each of the three components by mapping the relationships between the components of the sport organisation's environment in which they form a coherent and interconnected system. The risk identification and categorisation table places a strong emphasis on focusing on synergy and identifying clusters of risks which, as in the original framework, are considered to be more significant than individual isolated risks. Indeed, the nature of the sport environment, in which all components and factors are interconnected, is a characteristic feature and a challenge for effective risk management (Figure 6).



Sport risks identification & categorization grid

Figure 6: Sport Risk Identification & Categorization Grid

An extremely important part of the environment of sports organizations not only in Slovakia but also in the global dimension is the influence of stakeholders on the club itself. A major aspect that plays a significant role when examining the influence of stakeholders on a sports club is the dualistic nature of the sports business. This is because, according to him, the success of a sports club is determined by two important objectives:

- Achieving the desired sporting results.
- Achieving good economic results.

Stakeholder influence on sports clubs is generally considered to be a significant source of risk operating in all three components of the environment. Stakeholders and their influence on a sports club, shown in Figure 3, fundamentally affect the degree of stability of the environment, thereby also changing the conditions in which the club operates. For this reason, it is essential to include knowledge from this area in the framework education of sports club managers. Based on the described dualistic nature of sports organisations, stakeholders can be divided into two basic groups according to the underlying factor of their interest (Figure 7):

• Group 1 - stakeholders whose interest is primarily determined by the economic performance and material security of the club. These stakeholders, through motivation, effort and support, create the conditions necessary to achieve good

sporting results. These include athletes and sports professionals (club staff), parents and athlete organisations.

• Group 2 - stakeholders whose interest is conditioned by the achievement of good sporting results and the associated popularity of the club. On this basis, these stakeholders are able to provide material and financial support to the club. These are mainly sponsors, fans, NGOs working with clubs, the public and governmental organisations at central level.



Figure 7: Diagram of the Influence of Interest Groups on the Main Components of the Dualistic Nature of Sports Business

Through this division, it is also possible to think of interest groups as factors in the individual components of the sport club environment that may represent a potential source of risks but also opportunities for the club. These risks and opportunities arise from anticipated changes that may threaten the functioning of the club or bring a new quality to the environment perceived as an opportunity for further development of the club.

## **Educational Octagon Framework**

Based on the requirements and needs of sports clubs in Slovakia identified in the survey and based on further research into environmental components as sources of risk factors, the originally proposed educational framework was optimised. The new framework (Figure 8) is better suited to the requirements placed on clubs in the area of risk management and is set up to reflect, as far as possible, the needs arising from the factors of the different environmental components of the sports sector. This new framework, named as the 'Educational octagon framework', consists of the following components:

- 1 core learning module,
- 8 main learning modules,
- 2 optional learning modules.

The core learning module is, like the previous system, based on a core module, the content of which consists of the background, standards and implementation of the risk management process in an organisation according to ISO 31000:2019 and ISO 9001 based on their

requirements. This core module forms the basic prerequisite for learning in the other modules of the learning framework. The number of main learning modules has been increased to 8, and these emphasize an understanding of the functioning of the components of the environment and the different categories of risk arising from them. These learning modules target on individual areas and processes of risk management based on ISO 31000:2019 optimised for the field of sports organisations. The system also includes two optional learning modules that reflect the findings of the questionnaire survey. Optional modules can be placed in any area of the Educational octagon, and their content can be modelled according to which core learning modules in the framework structure they link.



Figure 8: Educational Octagon Framework for Sport Clubs Managers

The improved version of the learning framework still retains the advantage of the modularity of the system, which makes it possible to adapt the content of the learning and the composition of the framework to the specific requirements of the qualification level of the target group of sport managers. The results of the statistical research clearly demonstrated the different level of qualification of the persons concerned for the job of a sports club manager, to which the Educational Octagon responds with the possibility of individual customisation. However, in contrast to the previous version of the model, the Educational Octagon places increased emphasis on the individual categories of sport risks based on the identification of the main areas according to the origin of the sport club risks. This system takes into account the ternary structure of the sports club environment, which breaks away from the standard two-component system known from other sectors and organisations.

#### Conclusion

The original educational model proposed on the basis of research into aspects of the functioning of sports clubs was subsequently revised in the light of new findings in this area

and on the basis of a statistical survey carried out among Slovak sports clubs. On the basis of the facts and findings based on these processes, an updated module was created for the education of sports managers and risk management professionals. The main changes in this framework are primarily based on research into the typology of sport risks combined with the specific structure of the environment, which creates a unique system in the issue of risk in sport organizations. Based on the results of this research, future manager education should place particular emphasis on creating and exploring scenarios in which risks act together to create synergies.

The educational octagon is based on the system of education of professionals in the private, public and state spheres, which is implemented by the Faculty of Security Engineering of the University of Žilina in Žilina. The improved version of the educational framework is the result of optimization of the initial version based on specific requirements and the current situation of sports clubs in Slovakia. Successful testing of this version of the framework will be followed by research into the possibilities of integrating it into the standard education of sports club managers and the use of other elements, especially modelling and simulation using virtual and augmented reality, or elements of artificial intelligence. We expect that these technologies will make the whole educational process more attractive and effective by providing the opportunity to gain practical experience in a controlled academic environment.

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## Appraising the Integration of Training and Education in Masters-Level Apprenticeship Courses

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#### Abstract

The advent of Level 7 (L7) apprenticeships over the past decade has presented a number of challenges and opportunities to the UK Higher Education sector. Whilst new market(s) were opened to universities and other educational establishments, the differences between apprenticeship training and 'standard' masters-level education needed exploration and quantification and a means had to be devised to deliver training into the marketplace. Two primary approaches to achieve this were implemented, the first being the creation of dedicated apprenticeship-only training courses at L7, the second being to broaden the scope of existing masters courses to include apprenticeship training. In this latter approach, apprentices are taught side-by-side with masters-only students, and this means that a single course needs to be able to successfully deliver educational and training needs. This presented a significant challenge, and one that needed to be perfected over time. As a case study, this paper considers how Cranfield University's Systems Engineering MSc course team approached this task. The process by which the existing course was modified and subsequently revised in the light of experience is documented focusing upon the need to meet apprenticeship aims, and knowledge, skills and behaviour (KSB) criteria stipulated by the relevant apprenticeship standard, whilst not adversely affecting the existing educational offering. An appraisal will be made using lessons learned from experience and considering feedback from students, employers, and academics, together with existing literature, to identify successes and potential improvements and recommend suggestions to support continued apprenticeship development and good practice.

Keywords: Apprenticeship, Education, Training

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## Introduction

The introduction of level seven (L7) apprenticeship training courses to the UK Higher Education sector over the past decade (UK Government, 2015) has offered a number of opportunities to both universities and students. Such courses broadened the range of qualifications available to students whilst at the same time offering an alternative to the standard taught or research-based masters courses such as MSc, MBA, or MPhil. L7 apprenticeships soon grew in popularity (THE, 2018); this rise in popularity of L7 apprenticeships stemmed in part from the fact that apprenticeships were funded by the UK Government's apprenticeship levy (Allen, 2016; UK Government, 2016, 2018a), but was also in part because of the practical, work-based skills focus and generation which they offered to students and their employers alike (University of Strathclyde, 2024). Doughty (2018) quoted Petra Wilton of the Chartered Management Institute as saying: "It's getting [students] the best of all worlds, You get a full degree from a recognised university, work-based learning from an employer and the chance to have a practical impact on your workplace, plus professional recognition through the degree's chartered status - three in one." The Office for Students corroborated this view of L7 apprenticeships, stating a number of benefits for apprentices which included "You will learn skills that are directly relevant to a particular career, and gain work experience in that area. With degree apprenticeships, your degree will be viewed as the equal of a degree earned through traditional routes into higher education, and will be recognised by other employers." (OfS, 2024). In addition to these benefits for employers and students, the L7 apprenticeship scheme also offered clear benefits to universities and other education suppliers. A new market was opened to individuals and employers who might not previously have viewed higher education as a viable or appropriate path to learning and development, whilst a new revenue stream was also accessible. This last was aided by the opening up of the apprenticeship levy in 2018 (UK Government, 2018b).

With such opportunity, however, came challenges. There were two principal approaches to developing apprenticeships – either the creation of new, bespoke L7 apprenticeship courses, or by combining L7 apprenticeship requirements into existing masters-level courses.

Where apprenticeships were incorporated into existing masters-level (L7) taught courses, a means needed to be found of including within the course the necessary structures and information to deliver apprenticeship training whilst not compromising the integrity of the existing taught course. This required consideration not only of teaching and learning content but also of how it could be packaged such that the course would be compliant with apprenticeship requirements in terms of the number of hours an apprentice could study (known as 'off the job hours'). The mix of educational styles also needed to be considered, in that practices normally employed for educational purposes were found not necessarily to work for apprenticeship training, and vice versa. Moreover, it was soon found during development and initial delivery of apprenticeship training that apprentices did not necessarily have the same educational and experiential background of masters-level taught students, and this had to be factored into the planning and delivery of teaching. The learning styles – an essential consideration when developing courses (Barker & Smith, 2021) – of apprentices also had to be analysed and integrated into the teaching and learning plans.

This paper will take these factors into consideration by appraising the task of creating a course which cates for both taught masters students and L7 apprentices based upon learning from experience as a result of developing Cranfield University's Systems Engineering MSc and L7 Apprenticeship course, describing the factors necessary in the development of such a

course, and taking a view of the feedback from both students and apprentices, and also employers and course delivery staff. Conclusions will be drawn as to how continued development of the course can be supported and maintained.

## The Nature of Apprenticeships: Factors for Consideration

The structure and teaching learning requirements for an apprenticeship are laid out in the appropriate apprenticeship standard (IfATE, 2024)), with standards being specific to individual topic and educational level (UK Government, 2024a). Standards stipulate the aim and subject matter which apprenticeship courses must cover, detailed in the form of KSB (Knowledge, Skills, and Behaviours) statements, which are the "core attributes an apprentice must demonstrate in order to be competent in their occupation" (Queen Mary Academy, 2024) and which form the basis for assessment at End Point Assessment (UK Government, 2024b). The structure of the MSc and apprenticeship then saw an apprentice study alongside taught masters students for the duration of the course, whilst simultaneously accruing evidence of workplace practice to demonstrate that KSBs had been met, and taking part in three monthly tripartite meetings with the university's apprenticeship tutor and their workplace mentor to ensure that sufficient progress was being made toward the End Point Assessment (EPA). Following successful completion of the MSc, the apprentice would then prepare evidence to be assessed at EPA, and if the outcome was successful, would be awarded the L7 apprenticeship.

This created a number of challenges when combining the apprenticeship requirements with the existing taught course, and these are detailed below:

- L7 apprentices and masters students taught side-by-side
- Need to combine L7 apprenticeship requirements with masters-level education
  - Incorporation of Apprenticeship standard requirements and KSBs
  - Inclusion of apprenticeship content whilst not disrupting flow of 'normal' MSc
  - Linking course content to tri-partite meetings, and apprentices' progress toward EPA

In addition to structural considerations, it was also necessary to consider the expectations of apprentices and their employers, but also of the taught masters-level students, who did not want to be given material which they might deem extraneous and not relevant to their normal study experience. Apprentices (and employers) would reasonably expect the course to be tuned to the learning of KSBs and preparation for and achievement of EPA, but this presented challenges when viewed in the context of the expectations of L7 education, some of which expectations, and associated challenges, are detailed at table one. The potential disparity in experience and level of educational qualification attained between taught MSc students and apprentices presented a particular challenge in that it was found that apprentices benefited from a more structured, gradual learning experience than might otherwise be expected at L7, and that provision of such an approach might frustrate the learning experience of taught MSc students. This required a balance to be struck so that MSc students did not feel as though the course was being specifically catered toward apprentices, whilst apprentices did not feel unsupported by course and module content that either progressed at too rapid a rate or did not contain what they might deem to be essential information needed to support their learning and comprehension. Careful consideration therefore needed to be given information regarding KSBs could be incorporated, linked to taught MSc intended learning objectives (ILOs), and to specific elements of course material. The fact that apprentices were effectively on 'day release' from their normal employment also need to be factored in,

because this proved to be a constraint on the amount of work – or 'Off The Job' (OTJ) hours – that they could be expected to do, and the knock-on effect of this was that it needed to be harmonised across both sets of learners – MSc students and apprentices. This time dimension together with pressure of everyday work created what was to an extent a changeable learning environment in which careful andragogical consideration was needed as to how apprentices – and students – were to be supported (Barker & Smith, 2021; Barker, 2021a).

L7 education expectation	Challenge for incorporation of apprenticeship	
L7 masters-level develops the ability to judge, appraise, defend and justify a situation both individually and in collaboration with others, activities toward the higher end of Bloom's taxonomy (Armstrong, 2010)	<ul> <li>L7 education can be predicated upon basis provided by L6 education, which apprentices don't necessarily have</li> <li>Apprentices might possess different educational and experiential qualities to taught MSc students</li> </ul>	
Can often relate to situations where there is no defined or correct solution	- Additional support might be required in educating apprentices and students to deal with uncertainty	
Differs from lower-level qualifications in that they are often more foundational in nature and deal with more fixed parameters in situations where there is generally a 'right' answer	- If apprentices lack an immediate lower- level qualification (e.g. L6) then expectations of L7 education might prove challenging	
Students must therefore be able to develop and demonstrate the ability to rationalise, develop an answer or approach, and be able to provide the supporting rationale behind their decision-making	- The more formulaic nature of some lower-level qualifications could pose a challenge for individuals needing to make a leap from guidance to self- regulation and independent activity	

Table 1: L7 Expectations and	Challenges for Incor	porating Apprenticeshi	p Learning
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The need to link ILOs which describe key learning outcomes to be achieved by a course, and KSBs proved to be an additional challenge, for the following reasons:

- ILOs might be fewer in number and broader in nature than KSBs
- Need to map them together to ensure coherence in that
  - Course can deliver KSBs for apprentices whilst
  - Still meeting course and module-level ILOs
  - ° Iterative process requiring documentation, review, and university validation

ILOs tend toward description of broader activities, such as "Formulate and apply a systems thinking approach to suitable areas of consideration," whilst KSBs can be specific and more formulaic in nature – identifying specific benefits or creating particular logical representations – and this creates a challenge as to how a teaching strategy can be designed to incorporate mechanisms which will deliver against both. The broader aspects of ILOs might be seen to lend themselves to a wider, discursive, more analytic and reflective educational approach, whilst more specific tasks embodied in some KSBs might warrant a more training-focused practice. Careful thought was therefore necessary as to how such approaches could be linked, focusing on a more progressive strategy that incorporated a step-by-step andragogy which built knowledge incrementally by first describing concepts in structure and

behavioural terms to embed essential understanding before proceeding to more advanced philosophical and reflective ideas.

## An Andragogy Incorporating Education and Training

There is a dichotomy between philosophies of education and training which needs to be addressed when considering the needs of combining an apprenticeship with an existing masters-level course. Barker (2014) noted that education and training usually require different teaching strategies; education evokes ideas of a 'journey of learning': Plato talked of education as a search for the truth (Plato, 2007), whilst other sources talk of developing an intellectual capacity through evaluation and debate (Kant, 1997), and a process "driven by the self through a need for self-fulfilment" (Barker, 2014). Training, on the other hand, encompasses ideas of "the acquisition of skills, concepts or attitudes that result in improved performance in an on-job situation." (Goldstein, 1980) and "the systematic development of the attitudes/knowledge/skill behaviour patterns required by an individual in order to perform adequately a given task or job" (DoE, 1971). It can be seen from this that education and training have seemingly different requirements; whereas education is concerned with the search for knowledge, training is more specific, systematic, and directed in its nature. Moreover, there is little concept of adequacy in in education. This is still further complicated by apprentices' ability to learn and achieve their chosen L7 qualification being potentially affected by factors such as:

• demographic

• previous education

• experience

• Expectations

• expertise

Employer's expectations of apprenticeship training, taken from feedback received on the course, are that the apprentices' skills will be enhanced in a way which will benefit their organisation by making the apprentice better at their job or role, and a more valuable employee as a result. This might initially be seen as more aligned to the idea of training as described above, underlying improvements in specific skills is the need to understand, appraise, and evaluate how to use those skills to better effect, considering issues and outcomes which might previously not have been apparent. Thus there can be seen to be a clear educational aspect to apprenticeship training. With this identification, suitable strategies for teaching could be identified.

## A Teaching Strategy for L7 MSc and Apprenticeship

The way in which educational and training ideas and concepts are combined will differ from subject to subject: a course focusing on executive-level strategic management will necessarily utilise different approaches to a course focusing upon the development of Artificial Intelligence, for example. For Systems Engineering (SE), the ethos is upon a highly reflective and analytical approach to problem identification and characterisation, developing requirements which can then aid the design and implementation of a suitable solution which can be utilised to solve the problem. This encompasses many aspects, including systems thinking about the problem space, development of stakeholder requirements and associated logical architecture, before potential solutions can be identified, evaluated, and down-selected. System requirements describe the required functionality and other factors pertaining to the chosen solution, and physical architecture and design then specify what is to be developed. At the same time, factors such as integration, verification, transition into service, validation and final acceptance are considered. The utilisation phase of the solutions lifecycle

is also mapped out, through until retirement and disposal. This process places a heavy emphasis upon the ability to conduct analysis and evaluation of a high quality, judgement, justification, and provision of evidence and rationale, all of which loan themselves to an education-focused approach. However, initial concepts such as completeness (holism), emergence, entropy, homeostasis, and viability can be discussed in a more structured manner utilising definitions and examples in context to convey meaning and understanding. In the same way, instruction can be provided on the nature, form, characteristics, and usage of different modelling techniques such as stakeholder identification, architecture frameworks, and modelling languages, and this can be achieved in a manner more akin to training. As such it can be seen that the two philosophies can be melded together, commencing with a training-based approach that evolves into a deeper, more questioning educational construct which satisfies both KSBs and broader ILOs. This 'middle way' enfranchising both apprentices and Masters-only students could employ the ideas expressed at table two below.

This idea can be potentially complex in nature and necessitates use of a flexible approach to learning within structured bounds that utilises methods of teaching and learning which both apprentices and masters-only students can relate to (Barker, 2021b). The approach settled upon must be seamless and integrated so that apprentices and students don't feel that certain elements of learning are not relevant to them, and it must also provide a structured learning experience which achieves the following:

- Cover essential topics, concepts and ideas which are essential to the understanding of systems engineering (SE) and which provide a holistic understanding of the subject in contexts which are both relatable and directly relevant to apprentices and MSc students
- Develop confidence in all areas of a cohort that they can achieve outcomes
- Gradually increase difficulty of learning objectives through a gradual process of stepby-step learning that first introduces key concepts before evolving toward advance practice with more testing challenges and assessments requiring a greater level of cognition, analysis, appraisal, and evaluation
- Be flexible enough to find the correct pace of learning whilst encouraging exploration of the subject area and development of analytical approaches which are underpinned by justification, appropriate evidence, and rationale to support evaluation and decision-making
- Use a range of teaching techniques and assessment types to stimulate and develop apprentices and students

The adoption of this approach was intended to strike a middle path which met the learning needs of both apprentices and MSc students whilst also satisfying expectations of other parties such as employers through combination of underpinning learning with student support and apprenticeship requirements in the form of tri-partite meetings, together with wider course activities such as student liaison committees.

	Andragogical device	Purpose
1.	Directed instructional	- illustrate process and procedure
	sessions, podcasts, and/or	- describe concepts and their meaning
	demonstrations	- describe modelling techniques and ideas, and how to
		use and apply them
2.	Discussions of domain or	- place understanding in different organizational and
	organisation-specific case	enterprise-level contexts
	studies	- illustrate use of different ideas, tools and techniques in
		context
		- Demonstration of applicability of systems engineering
		(SE) approach
3.	Package information into	- Make information more comprehensible
	'accessible chunks'	- Allow learners to study at their own rate
		- Allow apprentices to manage time budgets
4.	Use of guest speakers to	- Provide first-hand insight to benefits of SE
	add additional context	- Illustrate use of ideas, tools and techniques in real-life
		context
5.	Provision of worked	- illustrate benefits of SE approach
	examples	- provide basis of understanding through illustration of
		possible outcome
		- spark discussion and generate ideas
6.	Guided workshops	- generate knowledge and expertise
		- allow application of SE ideas and techniques to a
		relevant real-life or work-based context
7.	A range of formative and	- test different aspects of learning and understanding
	summative assessment	- test ability to apply SE appropriately and in context
	approaches	
8.	A mix of individual and	- Facilitate development of independent learning
	group tasks	- Promote group work and learning
		- Allow dissemination of knowledge and experience
		through the cohort
9.	Provision of targeted	- Support apprentices and MSc students through their
	support for all students	learning journey
		- tailor learning to individual needs
		- allow, within bounds, people to learn at their own pace

#### Table 2: Potential Teaching Strategy for L7 MSc and Apprenticeship

#### Feedback on Teaching Strategy From Stakeholders

Following identification of the potential teaching strategy described at table two, the concept was refined using input from members of the course team, the university office responsible for apprenticeship experience and progression, and student support services. Feedback from previous cohorts of students was also factored in, as was information on the needs of employers and industry taken from the course's Industrial Advisory Board (IAB). The blend of training and education techniques incorporated in the resulting approach met with a favourable response, with feedback showing that it provided the intended initial gradual learning curve to first instill the essential concepts and techniques of SE before building to cover more complex ideas and necessitating a greater degree of self-driven learning, reflection and evaluation. In particular, feedback from apprentices, and MSc students,

suggested that the chosen and ragogical teaching strategy afforded them the following benefits:

- Clear instruction and provision of information
- Time to understand and apply ideas and techniques in a structured way
- An approach which built confidence in understanding by introducing ideas gradually and in a logical, understandable framework
- relevance of material to their own experience
- the ability to specialise learning through taking elective modules linked to apprentice/student areas of interest or specialism
- a supportive learning environment through provision of individual mentors, an apprenticeship tutor, student support services, and a thesis supervisor

This broadly positive feedback allowed further refinement to the course, utilising recommendations to achieve improvements such as an increased use of technology, addition of module content relevant to apprentices and MSc students, and to further develop methods of individual support for individuals on their learning journey.

Feedback from employers was also sought through regular apprentice tri-partite meetings, and also through the IAB. The employers stressed the importance of structured review, demonstration of progress, and development of applicable skills, knowledge and expertise, and their comments suggested that the course and it's teaching strategy was viewed as:

- Providing a structured and learning programme
- Mapping well in terms of content and subject matter to industrial need
- Allowing apprentices to progress well toward their EPA

This process of feedback and review needs to be continuous, but results were deemed positive, and in addition there was review internally to the course team and student support teams to identify improvements that could be realised. This highlighted the need to tailor support for different individuals and cohort mixes, continue to develop suitably flexible teaching strategies and approaches, to learn from apprentices' views of industry and to potentially develop closer links with industry as a result. This continual review also highlighted the need for continual review and 'flexible adaptation' of the course offering to maintain a pace with the changing nature and latest developments in the field of SE.

#### **Conclusions and Lessons Learned**

It is important to acknowledge that development and delivery of a course, especially where an existing course structure is being modified and revised to incorporate new ideas and structural needs in the form of an apprenticeship, is a learning experience not just for those who study on the course, but also for those who develop, deliver, and support it. Among the key lessons to be learned from this were the need for continual and clear communication in the following aspects:

- Clarity of information provided to learners, and points during the course at which information should be provided
- Linked to the above point, the provision of a clear roadmap detailing structure of the course, path to attainment of intended qualification, and processes by which the course will operate
- Clarity in how students can access support and the procedure that needs to be followed

- Communication between course, administration, and support teams to provide clarity and seamless course delivery
- Consultation with employers and industry; the field of SE is rapidly evolving, and it is essential to understand which elements are most relevant and valued by industry

Among other important conclusions from this process were that the andragogical teaching strategy needs to be both multi-faceted and capable of change as required because of the following factors:

- No two cohorts of apprentices and masters-only students are necessarily similar
- Different learners need support in different ways
- Different types of learners can spur development of teaching ideas in different ways, evolving ideas around different techniques and approaches to how they might be employed to support the learning journey

The necessity to stay current with needs and requirements of industry, and the potentially increased opportunity to consult with industry were also key outputs from the process as identified in the above lessons learned. This generated ideas for future work, which centred around the need to continue to develop the 'flexible teaching strategy' to adapt to and support learner's needs whilst also keeping pace with developments in the field of SE and remain relevant to employer and industry needs. There is also the need to ensure regular student and employer-facing review meetings, and to seek on an ongoing basis new methods of enhancing and developing the course and its delivery.

### Notes

DAS: No new data was created or analysed in this study. Data sharing is not applicable to this article.

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## The Development of Kindergarten Teachers' Identities as STEM Teachers: A Hong Kong Case Study

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#### Abstract

This study explores the development of kindergarten teachers' identities as STEM (Science, Technology, Engineering and Mathematics) educators in early childhood education. Six teachers were chosen as case studies, representing diverse experiences and exposure to STEM education. The research found that personal interest, professional development, and supportive environments significantly shape teachers' identities as STEM educators. Teachers with formal training and access to STEM-focused professional development demonstrated more effective integration of STEM concepts into their instructional practices. A classroom environment fostering curiosity, problem-solving, and collaboration is crucial for successfully implementing STEM education. The study suggests continuous and targeted training in STEM education into early childhood curricula. However, limitations include a limited sample size and the need for further research on the long-term impact of teachers' identity development on students' STEM learning outcomes.

Keywords: Early Childhood Education, Kindergarten Teachers, Identity Development, Professional Development, STEM Integration

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## Introduction

STEM (Science, Technology, Engineering, and Mathematics) education has gained significant attention recently due to its role in preparing students for future careers and fostering critical thinking and problem-solving skills (National Research Council, 2011). Early childhood, including the kindergarten stage, is crucial for laying the foundation of STEM (Galanti & Holincheck, 2024). Research has shown that early exposure to STEM concepts and experiences can positively impact students' attitudes and achievement (Boeve-De Pauw et al., 2024; Bybee, 2010).

Kindergarten teachers are pivotal in shaping young children (Bleicher, 2004). Their identities as STEM teachers, encompassing their beliefs, values, and self-perceptions related to STEM education, influence their instructional practices and student interactions (Wan et al., 2021). When kindergarten teachers identify themselves as competent and confident STEM educators, they are more likely to inspire and engage students in STEM activities (Erol & Erol, 2024). Therefore, understanding the development of kindergarten teachers' identities as STEM teachers is crucial for enhancing STEM education in early childhood settings.

This research aims to explore and understand the development of kindergarten teachers' identities as STEM teachers using a case study methodology. The specific objectives of this study are: a) To examine the factors that influence the development of kindergarten teachers' identities as STEM teachers; b) To investigate the relationship between kindergarten teachers' STEM identities and their instructional practices in the classroom; c) To explore the impact of kindergarten teachers' STEM identities on students' attitudes and engagement in STEM subjects.

#### **Research Questions**

The following research questions will guide this investigation:

- 1. What factors contribute to developing kindergarten teachers' identities as STEM teachers?
- 2. How do kindergarten teachers' STEM identities influence their instructional practices in the classroom?
- 3. What is the relationship between kindergarten teachers' STEM identities and students' attitudes and engagement in STEM subjects?

#### Literature Review

#### **Theoretical Perspectives on Teacher Identity Development**

Social identity theory suggests that individuals develop their sense of self and identity based on their membership in social groups (Tajfel et al., 1979). In the context of teacher identity development, this theory posits that kindergarten teachers' identities as STEM teachers may be influenced by their identification with the broader STEM education community.

Self-efficacy theory emphasises teachers' beliefs' role in effectively teaching STEM subjects (Bandura, 1977). Teachers with high self-efficacy in STEM education are likely to engage students and create a positive learning environment.

# Theoretical Frameworks Relevant to the Development of Kindergarten Teachers' Identities as STEM Teachers

The TPACK framework emphasises integrating technology, pedagogy, and content knowledge in effective STEM teaching (Mishra & Koehler, 2006). For kindergarten teachers, developing a deep understanding of STEM content knowledge and pedagogical strategies is essential for effective STEM instruction.

Situated learning theory posits that learning occurs in real-life contexts and within communities of practice (Lave & Wenger, 1991). When applied to the development of kindergarten teachers' STEM identities, this theory underscores the significance of creating opportunities for teachers to participate in meaningful and authentic STEM experiences, both within and beyond the confines of the classroom.

## Methodology

This study adopts a qualitative case study methodology to explore the development of kindergarten teachers' identities as STEM teachers. Case study research allows for an indepth examination of a specific phenomenon within its real-life context (Lave & Wenger, 1991). This research aims to comprehensively understand the complex nature of kindergarten teachers' identity development in STEM education by focusing on two cases.

Case study data is utilized to provide an in-depth and comprehensive description of real-life situations (Yin, 2018). This approach allows researchers to explore complex phenomena within their contexts, making it particularly valuable for understanding the nuances of kindergarten teachers' identities as STEM educators. To enhance the reliability and validity of the findings, data collected from case studies was triangulated with information obtained from interviews and open-ended survey questions. This triangulation helps to corroborate findings across different data sources, thereby strengthening the overall conclusions.

The data collection process was conducted in stages, beginning with online surveys to gather initial insights and quantitative data regarding teachers' experiences and perceptions of STEM education. Following this, semi-structured interviews were conducted to obtain more in-depth qualitative information, allowing participants to elaborate on their experiences and views. This two-tiered approach facilitated a richer understanding of the factors influencing teacher identity development in STEM contexts.

Data analysis was carried out according to established protocols for assessing observational data and indicators, as outlined by Braun and Clarke (2006). Thematic analysis was employed to identify, analyze, and report patterns (themes) within the data. This method allowed for a systematic examination of the data, ensuring that key themes related to teachers' identities, professional development, and classroom practices were thoroughly explored and articulated.

By employing a rigorous methodology that combines case study data with qualitative interviews and surveys, this research provides a robust foundation for understanding the complexities of kindergarten teachers' identities as STEM educators.

The selection of cases in this study was guided by purposeful sampling, aiming to identify kindergarten teachers with varying levels of experience, training, and exposure to STEM

education. The rationale for selecting multiple cases is to capture a range of experiences and perspectives, enhancing the findings' validity and generalizability (Merriam & Grenier, 2019).

Semi-structured interviews were conducted with each participating kindergarten teacher to explore their experiences, beliefs, and practices related to STEM education. The interviews were audio-recorded with the participant's consent, transcribed verbatim, and analysed to identify key themes and patterns (Malterud & Guassora, 2016).

The kindergarten teachers' STEM instruction was observed to gain insights into their instructional practices and the integration of STEM concepts in the classroom. Detailed field notes were taken during the observations, capturing essential aspects such as teaching strategies, student engagement, and using materials and resources (Glesne, 2016).

A thorough analysis of relevant documents, such as lesson plans and teaching materials, complemented the interview and observation data. This analysis provided additional insights into the teachers' planning processes, instructional strategies, and the alignment between their intentions and actual practices (Bowen, 2009).

The interview transcripts, observation field notes, and document analysis data will be analysed using a coding and thematic analysis approach. The data will be coded to identify recurring patterns, themes, and categories related to kindergarten teachers' identity development as STEM teachers (Braun & Clarke, 2019). This process will involve iterative coding, constant comparison, and the development of thematic frameworks.

A cross-case analysis will compare and contrast the findings across the different cases. This analysis involves synthesising the themes and patterns identified within each case and exploring similarities and differences between the cases (Merriam & Grenier, 2019). This comparative analysis contributed to a deeper understanding of the factors influencing kindergarten teachers' identities as STEM teachers.

## **Data Analysis**

Inductive and thematic analysis techniques were employed to identify, evaluate, and develop themes that reflect participants' shared experiences (Fereday & Muir-Cochrane, 2006). In the initial stage, each participant's responses were coded using specific keywords to minimize redundancy. To facilitate the coding and categorization process, NVivo 12 software was utilized. This software helped organize data from both surveys and interviews through the use of Nodes and Cases. Thematic maps were created to illustrate the organization of concepts at various levels and to explore potential connections between them. Subsequently, the research team examined both the codes and categories, considering the possibility of merging certain codes for greater efficiency. This inductive approach allowed for the identification of key themes emerging from participants' responses to the research questions (Fereday & Muir-Cochrane, 2006).

#### Findings

#### Case Study 1: Kindergarten Teacher A

Kindergarten Teacher A has taught for seven years and participated in three professional development workshops focused on STEM education. She is intensely interested in science and technology and actively seeks opportunities to integrate STEM concepts into her teaching practice.

Her positive experiences influenced teacher A's identity as a STEM teacher in STEM subjects during her education. Additionally, her participation in STEM-focused professional development workshops and interactions with colleagues who shared her passion for STEM education significantly shaped her identity as a STEM teacher.

Teacher A actively incorporates STEM concepts into her lessons through hands-on activities and experiments. She utilises technology tools and resources to enhance student engagement and understanding of STEM subjects. Furthermore, she fosters a classroom environment that encourages curiosity, problem-solving, and collaboration among her students.

"I believe there is a substantial connection between knowledge and interest for teachers, as it is likely to impact their perception of their STEM identity."... "If you have a certain interest, it is possible that you perceive yourself as having a more distinct identity in that particular domain. If you see a deficiency in knowledge or a lack of interest in a certain subject, it is possible that you may also experience a weakened sense of identity." (Teacher A)

#### Case Study 2: Kindergarten Teacher B

Kindergarten Teacher B has been teaching for two years and has limited exposure to formal STEM education training. However, she is genuinely interested in STEM subjects and seeks opportunities to enhance her knowledge and skills.

Teacher B's identity as a STEM teacher was influenced by her interest in STEM subjects and her belief in the importance of STEM education for young children. Although she had limited formal training, she actively engaged in self-directed learning and sought resources and support from colleagues to develop her STEM teaching practices.

Teacher B incorporates STEM concepts into her classroom through project-based learning activities and open-ended investigations. She encourages her students to explore and question scientific phenomena and engineering challenges. Despite her limited training, she demonstrates enthusiasm and a willingness to learn alongside her students, fostering a positive classroom environment for STEM exploration.

"The development of a student's and teacher's identity concerning STEM will occur from their own inquiries and personal research, which is the essence of analytical and critical thinking. If you provide various resources in your classroom and you give weight to those resources." (Teacher B)

Teacher B is just beginning her journey in STEM education. Initially feeling unprepared, her interest in the field has grown through collaboration with more experienced colleagues. She

actively participates in team teaching and observes her peers' STEM lessons to enhance her own practices. This collaborative approach has greatly influenced her identity as a STEM teacher, as she learns to integrate hands-on activities into her classroom. Teacher G encourages her students to work together on projects and share their ideas, creating a sense of community and collaboration. She believes that learning from others is essential for building her confidence and competence in teaching STEM subjects.

"Working alongside my colleagues has been invaluable. I've learned so much from observing them and participating in team teaching. Collaboration not only enhances my teaching practice, but it also creates a community in the classroom where students feel comfortable sharing their ideas and working together." (Teacher B)

#### Case Study 3: Kindergarten Teacher C

Teacher C has been teaching for five years and has participated in various workshops and conferences focused on STEM education. With a strong background in environmental science, she is passionate about integrating sustainability into her lessons. Her identity as a STEM educator is closely tied to her commitment to environmental education. In her classroom, she engages students through hands-on activities such as recycling projects and nature walks. By connecting real-world issues to her lessons, she helps students understand important STEM concepts while encouraging them to think critically about their impact on the environment. Teacher C believes that teaching STEM is not just about the subjects themselves; it's about nurturing responsible future citizens who care for the planet.

"I believe that teaching about sustainability is crucial. When my students engage in projects like recycling, they not only learn about science but also develop a sense of responsibility toward the Earth. My goal is to help them see the connection between what they learn in class and the real world around them." (Teacher C)

#### Case Study 4: Kindergarten Teacher D

With eight years of teaching experience, Teacher D has a solid foundation in mathematics, having pursued additional coursework in early childhood math education. She firmly believes that developing early math skills is critical for children's future success in STEM fields. Teacher D uses games and interactive activities to promote logical reasoning and problemsolving among her students. By allowing children to explore mathematical concepts through play, she creates a supportive and engaging learning environment. Her goal is to foster a positive attitude toward math, as she knows that instilling confidence in students early on is key to building a strong STEM identity.

"Math can be intimidating for many kids, but I try to make it fun. By using games and hands-on activities, I help them see that math is all around us. I want them to feel confident in their abilities, because I truly believe that a strong foundation in math can open doors for them in the future." (Teacher D)

#### Case Study 5: Kindergarten Teacher E

Teacher E has been teaching for four years and initially had limited training in STEM education. However, her deep interest in technology motivated her to take online coding courses on her own. This self-directed learning has significantly shaped her identity as a

STEM educator. In her classroom, she introduces technology through coding games and robotics activities, encouraging students to explore and solve problems collaboratively. Despite her initial lack of formal training, her enthusiasm for technology inspires her students to engage with STEM learning. Teacher E believes that cultivating curiosity and creativity in her students is essential for developing a robust STEM identity.

"Even though I didn't have much formal training, my love for technology drives me to learn and explore. When my students code or build robots, I see their excitement. It's rewarding to watch them become problem solvers and innovators, and it motivates me to keep learning alongside them." (Teacher E)

## Case Study 6: Kindergarten Teacher F

Teacher F has been in the teaching profession for ten years and has extensive experience teaching science. She has participated in numerous professional development workshops focused on inquiry-based learning. Her identity as a STEM teacher is grounded in her belief that inquiry is vital for meaningful education. She designs her lessons around open-ended questions, allowing students to explore scientific phenomena. In her classroom, experimentation is encouraged, and mistakes are seen as valuable learning opportunities. This approach not only deepens her students' understanding of science but also promotes critical thinking and collaboration. Teacher F believes that nurturing an inquisitive mindset is crucial for students to develop a strong identity in STEM fields.

"I always tell my students that it's okay to make mistakes; that's how we learn! By asking open-ended questions, I encourage them to think critically and explore their curiosity. Inquiry-based learning not only makes science fun but also builds their confidence as young scientists." (Teacher F)

Teacher F is a strong advocate for STEM education in her school. She has led efforts to implement STEM curricula and has organized workshops for her colleagues. Her identity as a STEM educator is shaped by her leadership role and commitment to professional development. Teacher H actively mentors new teachers, sharing her insights and resources to support their growth. She emphasizes the importance of collaborative learning and encourages her students to take on leadership roles in STEM projects. By fostering a culture of inquiry and innovation, she not only enhances her students' STEM learning but also inspires her colleagues to embrace STEM education. Teacher H believes that creating a community of learners is vital for building a strong STEM identity for both students and teachers.

"Being a leader in STEM education is something I'm passionate about. I love mentoring new teachers and sharing resources. By fostering collaboration among students and teachers, we create an environment where everyone can thrive and develop their STEM identities together." (Teacher F)

#### **Comparison and Synthesis of Findings**

A comparison of the findings from the case studies reveals several common themes among the teachers' experiences and identities as STEM educators. Teachers A and B, along with Teachers C, D, E, and F, expressed a strong personal interest in STEM subjects and acknowledged the critical role of STEM education for young children. Each teacher actively sought out resources to enhance their teaching practices, whether through formal professional development workshops, self-directed learning, or collaboration with colleagues. This proactive approach facilitated the creation of classroom environments that fostered curiosity, problem-solving, and collaboration among students. The emphasis on hands-on activities and real-world applications in their lessons further illustrated a shared commitment to engaging young learners in meaningful STEM experiences.

However, differences also emerged regarding formal training and teaching experience. Teacher A, with her extensive formal training and participation in STEM-focused professional development specific to early childhood education (ECE), demonstrated a heightened level of confidence in her instructional practices. Her structured approach to integrating STEM concepts into her lessons was influenced significantly by her training and prior experiences. In contrast, Teacher B relied more on self-directed learning and informal colleague support to develop her STEM teaching practices. This reliance on informal networks highlights the varying paths teachers take in shaping their identities as STEM educators.

Further distinctions were observed in the experiences of Teachers C and E. Teacher C, with her background in environmental science, utilized her expertise to integrate sustainability into her curriculum, thereby enriching her students' understanding of both STEM concepts and their environmental impact. Meanwhile, Teacher E's enthusiasm for technology led her to explore coding and robotics independently, showcasing her initiative in filling the gaps left by formal training. Teachers F, G, and H also highlighted the importance of mentorship and collaboration. Teacher F's inquiry-based approach was deeply rooted in her belief that experimentation and curiosity drive scientific learning, while Teacher H's leadership role allowed her to foster a culture of inquiry and innovation, not only among her students but also her colleagues.

Overall, the findings underscore the complex nature of kindergarten teachers' identity development as STEM educators. They highlight the significance of personal interest, varying levels of professional development, and collaborative learning environments in shaping instructional practices and confidence in teaching STEM subjects. While some teachers benefitted from structured training and resources, others thrived through informal learning and peer support, illustrating the diverse pathways that contribute to effective STEM teaching. This synthesis emphasizes that nurturing a strong STEM identity among educators is essential for fostering an engaging and impactful learning experience for young students.

## Discussion

The findings of this study provide valuable insights into the development of kindergarten teachers' identities as STEM educators. Across all case studies, including Teacher A and Teacher B, the importance of personal interest, professional development, and supportive environments emerged as significant factors shaping teachers' practices. Teachers expressed a genuine passion for STEM subjects, which played a crucial role in their willingness to integrate these concepts into their classrooms. This intrinsic motivation was evident in how they approached lesson planning and student engagement, highlighting the significance of fostering a strong connection between teachers' interests and their instructional methods. Research indicates that teachers' identities are closely linked to their beliefs and attitudes towards STEM, which can significantly influence their teaching practices and student engagement (El Nagdi et al., 2018).

Furthermore, the results suggest that kindergarten teachers with formal training and access to STEM-focused professional development are more likely to integrate STEM concepts seamlessly into their teaching practices. For instance, Teacher A's extensive training and participation in workshops allowed her to confidently implement hands-on STEM activities, while Teacher C's background in environmental science enriched her curriculum with relevant, real-world applications. In contrast, Teacher B and Teacher E, despite their enthusiasm, demonstrated how limited formal training can hinder the effective implementation of STEM education, showing that self-directed learning, while beneficial, may not always fill the gaps left by formal education. Previous studies have shown that teachers who receive targeted professional development in STEM are better equipped to foster student interest and understanding in these subjects (Hachey, 2020).

The findings also emphasize the importance of fostering curiosity, problem-solving, and collaboration among young children. Teachers who created environments that encouraged exploration and inquiry were able to engage students more effectively in STEM learning. Teacher F's inquiry-based approach and Teacher D's interactive math games exemplify how nurturing these qualities can lead to a deeper understanding and appreciation of STEM subjects among young learners. Research supports the notion that early childhood classrooms are critical spaces for identity work, where children begin to form their STEM identities through engaging and meaningful experiences (Galanti, 2024).

Based on these findings, several implications for kindergarten teacher professional development can be drawn:

- Ongoing and Targeted Professional Development: Providing opportunities for continuous and focused professional development in STEM education is crucial. This could include workshops, courses, and collaborations with STEM experts, ensuring that teachers are equipped with the latest strategies and resources (Boeve-De Pauw et al., 2024; Fitzpatrick, 2024; Hachey, 2020).
- Addressing Specific Needs: Professional development programs should be tailored to the specific needs and interests of kindergarten teachers. Recognizing their prior experiences and varying levels of training will enhance the relevance and effectiveness of these programs (El Nagdi et al., 2018).
- *Mentoring and Peer Support:* Establishing mentoring and peer support networks can be vital in sustaining teachers' motivation and growth in STEM instruction. Such networks enable sharing of best practices, resources, and emotional support, fostering a collaborative culture among educators (Bybee, 2010; Galanti & Holincheck, 2024).

Based on the findings, several recommendations can be made to enhance STEM education in early childhood settings:

- *Prioritizing STEM Integration*: Educational policymakers and administrators should prioritize the integration of STEM into early childhood curricula and standards. This involves providing resources, materials, and learning opportunities that support teachers in implementing developmentally appropriate STEM activities (Hachey, 2020).
- *Encouraging Collaboration:* Collaboration among kindergarten teachers, subject matter experts, and researchers should be encouraged to share best practices, develop innovative instructional strategies, and create a supportive community of practice. This collaboration can lead to more effective teaching methods and a richer learning experience for students (El Nagdi et al., 2018).

• *Emphasizing Family Engagement:* Engaging families in STEM education is essential. Providing resources and workshops that empower parents and caregivers to support STEM learning at home can enhance the educational experience for children and reinforce the value of STEM in everyday life (Fitzpatrick, 2024; Galanti, 2024).

In summary, the findings from this study highlight the multifaceted nature of kindergarten teachers' identities as STEM educators and underscore the need for targeted support and resources. By addressing the identified areas for improvement, stakeholders can enhance the quality of STEM education in early childhood settings, ultimately benefiting both teachers and students.

### Conclusion

This study found that personal interest, professional development, and supportive environments are crucial for shaping kindergarten teachers' identities as STEM educators. The data revealed that teachers who possess a strong personal interest in STEM subjects are more likely to seek out professional development opportunities, which in turn enhances their effectiveness in integrating STEM concepts into their classrooms. Furthermore, the study underscored the significance of creating a classroom environment that fosters curiosity, problem-solving, and collaboration among young learners. Such an environment not only engages students but also cultivates a positive attitude towards STEM education.

The findings highlight the importance of tailored professional development and personalized support for teachers, as well as the necessity of integrating STEM education into early childhood curricula. Additionally, involving families in the process of supporting STEM learning plays a vital role in reinforcing the importance of these subjects outside the classroom. Overall, this study emphasizes that a multifaceted approach, combining teacher development, supportive environments, and family engagement, is essential for fostering a strong foundation in STEM education for young children.

## Limitations

Despite the valuable insights gained from this study, several limitations should be acknowledged. First, the sample size, while diverse, may not fully represent the broader population of kindergarten teachers across different regions or educational contexts. This could limit the generalizability of the findings. Second, the reliance on self-reported data from surveys and interviews may introduce bias, as teachers might present their practices in a more favorable light. Additionally, the study's cross-sectional design does not allow for the observation of changes in teachers' identities over time, which is crucial for understanding the long-term implications of professional development and support. Finally, while the study highlights the importance of family engagement in STEM education, it did not directly assess the impact of family involvement on student learning outcomes, an area that warrants further investigation.

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In the preparation of this paper, I acknowledge the use of generative AI and AI-assisted technologies to enhance the readability and clarity of the content. These tools were employed to support the writing process, helping to refine and organize ideas effectively. However, the final interpretations and conclusions presented in this work are entirely my own, reflecting my analysis and insights.

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# Deconstructing Complex Abstraction Through Context in Science Education: Comprehensive Review on Research Development, Approaches, and Articulation

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#### Abstract

There has been significant attention on context-based learning in science education in recent times, challenging conventional paradigms and fostering more inclusive and authentic learning experiences. However, research has shown that there are no simplified definitions of context, and without proper articulation, context becomes anything and everything. Evidence of what context is in science education has been analyzed, but not all contexts are useful for all complex science ideas and settings. Therefore, by performing a systematic literature review of empirical studies with an abstract search from three databases (Eric, Education Source and APA PsycInfo) with the filter "Context-based" and "secondary school or high school or secondary education or junior high or middle school", a total of 284 studies were found. These studies were screened for empirical and science education research to synthesize evidence of how context is used to deconstruct traditional paradigms in secondary science education. From an initial analysis, this article identifies emergent contributions to context-based science education including context-continuum learning design, student's meaning-making of concepts in context, and the "frame of context" articulated for specific science concepts. This review draws the connection between context articulation and fostering deeper connections between students' learning and the real world that would enhance student engagement and authentic science learning. This study makes a case for the relevant context that diffuses complex science concepts for learners. The practical implications offer insights into the frame of context that can be explored for specific complex concepts in science education.

Keywords: Complex Abstraction, Context, Science Education

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#### Introduction

Science education serves as a cornerstone for cultivating critical thinking, innovation, and problem-solving skills in students (Verawati & Sarjan, 2023). However, a persistent challenge within the discipline lies in its presentation such that concepts are often abstract and disconnected from real-world contexts rather than an immersion (Giamellaro, 2014; Gilbert, 2006; Sadler, 2009). This disconnection has far-reaching implications, as it impacts students' enthusiasm, motivation, and ability to engage in critical thinking, thereby limiting the transformative potential of science education (Boisselle, 2016). Remedying this situation requires a paradigm shift, involving the deconstruction of abstract concepts through context-driven learning models.

One critical concern is the tendency to treat science as a monolithic body of abstract knowledge rather than a dynamic, culturally situated, and context-sensitive discipline (Klein, 2018). Traditional pedagogical approaches often fail to engage students meaningfully, presenting science as a series of disconnected facts rather than as an iterative process of inquiry and discovery (Brookes et al., 2020; Tan & Wong, 2012). Such methods not only obscure the relevance of science to everyday life but also perpetuate inequities in learning outcomes, disproportionately affecting students from diverse cultural and socioeconomic backgrounds (Lee & Buxton, 2013). A contextual approach, by contrast, seeks to make science more inclusive and accessible by aligning instruction with the lived experiences, interests, and cultural frameworks of students (Brown et al., 2019).

Contextualized science education recognizes the importance of grounding abstract scientific principles in relatable, meaningful, and diverse settings (Garner, 2024). This approach seeks to bridge the gap between theoretical knowledge and practical application, moving students beyond rote memorization toward genuine understanding and critical engagement. Gilbert (2006) suggests that effective contextualization is based on three dimensions: physical settings, cultural justifications, and sociocultural perspectives on learning. Each dimension provides a unique lens for exploring how students interact with and internalize scientific knowledge. Physical settings anchor concepts in tangible, observable phenomena, while cultural justifications draw on societal values and beliefs to validate the relevance of science. Sociocultural perspectives emphasize collaborative learning and the role of social constructs in shaping scientific understanding. Together, these dimensions offer a holistic framework for transforming science education. Much research has proven the efficacy of contextualized science education in fostering deeper understanding and engagement (Bilican et al., 2015; Kuhn et al., 2017). Embedding scientific instructions within cultural narratives, such as indigenous knowledge systems or local norms, has been shown to enhance relevance, promoting more inclusive learning environments (Lam et al., 2020).

#### **Problematizing Context in Science Education**

The way context is viewed varies across settings, fields, and disciplines. In education, it would be difficult for learners to sufficiently organize, understand, interpret and describe concepts in a relevant way unless other implicating phenomena such as cultural setting, shared background, and prior experiences within which the learning is embedded are considered. Thus, Gilbert, (2006) indicated that context can be viewed as a frame that surrounds the focal event being examined, which in turn provides resources for its appropriate interpretation. What would be a relevant context to learners would be dependent on the activities they are engaged in at each point in time within a unit of learning. Therefore,

the context of learning changes radically from one learning activity to the other and is dynamically mutable (Harris et al., 2009; Li, 2016).

Furthermore, students and teachers can become an environment for each other elevating the potential and capacity of individuals to reshape context dynamically to further their interests and agenda (Bandura, 2006). Therefore, the learning environment notion of context is a social construct, which is time-bound and sustained by continuous interactions (AlabdulRazzak et al., 2018; Bloome et al., 2009). Context-based learning emerged and built upon the older education traditions of questioning the application of school learning, it emerged as a big idea in science education (King, 2009). Researchers have argued that context-based learning bridges the gap between school learning and real life, impacting the interest of students and their understanding of science (Aydin-Ceran, 2021; Parchmann et al., 2015). Hence the invocation and articulation of context in learning is dependent on each uni of learning and multiple contexts can be invoked within a single learning unit.

#### **Conceptual Frameworks**

#### Situated Learning Theory.

A strand of constructivist philosophy which highlights the importance of learning through participation in a community of practice (Sadler, 2009; Sentence & Humphreys, 2018). It emphasizes that knowledge is best acquired through authentic, real-world activities that are situated within the learners' lived experiences. This approach contrasts with traditional instructional methods that abstract knowledge from its application, which often leads to surface-level understanding and a disconnect from practical relevance. By engaging in tasks that align with their current needs and future goals, learners progressively move from peripheral to full participation, gaining skills in contexts that mirror real-life situations (Aithal & Mishra, 2024).



Figure 1: Situated Learning Model Source: Mina Herrera, S.P. (2022)

Situated learning involves "legitimate peripheral participation," where learners initially engage in simple, meaningful tasks before gradually moving toward more complex, expert-level practices (DeGirolamo et al., 2024). This progression mirrors the natural learning process in real-world communities of practice. For example, in science education, students could begin by observing ecological data collection before participating in fieldwork. By situating learning within real-world activities, students experience the relevance of abstract scientific principles and connect them to tangible outcomes. A crucial aspect of the theory is its emphasis on social interaction. Learning occurs through collaboration with peers, mentors, and experts, fostering the co-construction of knowledge (van Schaik, 2020). Furthermore, the physical and cultural environment plays a pivotal role in situated learning, science classrooms designed to mimic laboratories, field sites, or other relatable settings create immersive experiences that reflect real-world applications (Swargiary, 2024). Such environments also allow learners to explore sociocultural influences on scientific practices, enhancing their ability to navigate diverse professional landscapes.

# Gilbert (2006) Four Models of Context.

Gilbert's (2006) Four Models of Context provides a foundational framework for addressing the complexities of abstractions, especially in science education. These models highlight different approaches to embedding context in learning, offering strategies to make scientific knowledge accessible and relevant to learners.

Model 1: Context as the Direct Application of Concepts- considers context as a tool for illustrating pre-taught concepts. Just as introducing chemical equations and subsequently applying them to neutralize acid spills gives students a direct link between theory and practice. However, this approach often positions context as supplementary rather than integral, which may limit its ability to support deeper conceptual engagement.

Model 2: Context as Reciprocity Between Concepts and Applications- emphasizes the dynamic interplay between scientific ideas and their practical applications. This reciprocal relationship helps students refine their understanding by exploring how abstract concepts influence real-world problems and vice versa. However, care is to be taken to prevent cognitive overload when students juggle both theoretical and applied aspects simultaneously (Song et al., 2023).

Model 3: Context as Provided by Personal Mental Activity- recognizes the role of individual cognition in shaping context. By allowing students to draw on personal experiences, this model promotes a deeper connection to abstract scientific concepts. For example, a student might relate biological adaptations to personal observations in nature. While powerful, this model requires learners to be self-directed, which may challenge those needing structured guidance.

Model 4: Context as the Social Circumstances- integrates scientific learning into broader societal issues, making abstract concepts meaningful through cultural and environmental connections. Topics like climate change or public health serve as socially relevant contexts, promoting collaborative exploration and critical thinking. This model stresses the societal importance of science but demands significant effort in aligning content with real-world challenges.

This research intends to explore how context-driven frameworks can address the challenges posed by traditional science instruction, promoting deeper understanding and equity in learning.

#### Research Questions.

- 1. What contextual articulation is considered important to science subjects?
- 2. How is context articulated in the learning design?
- 3. What emergent design principles can be derived from the context-continuum model to support authentic science learning in secondary schools?

## Methods

## Procedure

This review is part of an ongoing research and thus it does not claim exhaustivity. The study adopted a systematic review of the literature method as described by (Booth et al., 2021). After the formulation of the research questions and objectives, the search parameters were defined, although the search parameter will still need to be adjusted to account for grey literature following the outcome of the review and the progress of the main research. Next, databases were selected and the literature search was initiated. This was followed by the development of the inclusion and exclusion criteria which served as the guide for screening the literature obtained through the database search. All relevant literature was carefully screened, and a data extraction form was carefully developed to allow for the comparison of the data from the articles. Lastly, the data obtained after being deemed to be of quality were synthesized to provide answers to the research questions.

#### **Databases and Search Parameters**

Three databases including Eric, Education Source, and APA PsycInfo were searched systematically, using the following search parameters "Context-based" and "secondary school or high school or secondary education or junior high or middle school". To publications obtained were then screened through the inclusion and exclusion criteria.

#### Inclusion Criteria

- 1. The study must be an empirical study
- 2. The study must be in the science field
- 3. The study must be peer-reviewed
- 4. Students must be the participants

#### Exclusion Criteria

- 1. Non-English articles are excluded
- 2. Theoretical/conceptual papers are excluded

#### Data Analysis

The data obtained was structured into seven categories, which were inductively deduced from the studies reviewed. These studies were screened for empirical and science education research to synthesise evidence of how context is used to deconstruct traditional paradigms in secondary science education. The procedure was discussed with multiple researchers to eliminate bias. The following categories were identified: Domain dominance, prescriptive context-based learning, relevance and real-world connection, learner-driven contextual environment, exploring students' personal and career aspirations in design, multiple knowledge presentation and representation, and context-continuum learning design.

## Search and Selection of Results

Figure 2 presents a summary of the entire search process in the form of a PRISMA diagram. After the search process, 2373 articles were identified from the 3 databases used, and 2089 articles were further removed through the set filters, leaving 284 articles to be screened. Following the screening, 187 articles were excluded based on abstract and title, with 95 being assessed for eligibility. 26 articles were included in the review after screening against the eligibility criteria.



Figure 2: PRISMA Framework

# Findings

Table 1 presents an overview of the studies that investigated Complex Abstraction Through Context in Science Education.

Author/Year	Discipline	Participants	Epistemology/ Theoretical Perspective	Activities / Context Articulated	Research Design
Afrah Assi & Anat Cohen (2024)	Chemistry	32 students	Constructivism	Pre-class activities flipped learning	Exploratory Case study
Shirly Avargil & Ran Piorko (2022)	Chemistry / Biotechnology	370 Students	Constructivism	Engaged with molecular structures	Comparative Study
Eralp BAHÇIVAN (2014)	Physics	30 students; 5 Teachers	Social Constructivism	Observed during typical physics lessons	Qualitative case study design
Medine Baran & A.Kadir Maskan (2016)	Science – Multidisciplin ary	5325 high school students	Constructivism	Used news reports and multimedia sources	Quantitative survey
Basso et al. (2018)	Chemistry	500 students participated over six years	Constructivism	A week-long crime scene investigation activity involving students in experiments across various chemistry branches	Survey
Chen et al. (2019)	Mechanical engineering and CNC machine tool operations	40 male students	Positivist	VR-based CNC milling machine training using either sequence-based or context-based teaching designs, including individual and integrative exercises	Experimental design
Cigdemoglu & Geban (2015)	Chemistry	175 students	Constructivism	Lessons structured around real-world applications of chemical reactions and energy concepts.	Quasi- experimental design
de Putter- Smits et al. (2012)	Biology, Chemistry, Physics	Teachers: 25 Students: 840	Constructivism	Teachers designed and implemented context-based curriculum materials across multiple science subjects (biology, chemistry, physics.	Comparative Study
Demelash et al. (2024)	Chemistry.	Students: 229	Social Constructivism	Simulations of chemistry concepts, Group discussions, student presentations, and Q&A sessions	Quasi- experimental design
Demircioğlu et al. (2009)	High school chemistry, with a specific emphasis on teaching the Periodic Table of Elements.	Students: 80 Teachers: 2	Constructivism	The instructional approach incorporates storylines	Quasi- experimental design

Table 1: Studies	That Investigated	Complex	Abstraction
Tuble 1. Studies	That mycongated	Complex	rostraction

Dhlamini (2016)	Mathematics, specifically focusing on financial	57 learners	Cognitive	The study used context-based problem-solving instruction (CBPSI)	Pre- experimental design
Parchmann, I., Gräsel, C., Baer, A., Nentwig, P., Demuth, R., & Ralle, B.	mathematics Chemistry	N/A – Germany	Constructivism.	Students engaged in planning and conducting investigations tied to real-life contexts.	Case Study
Dori, Y. J., Avargil, S., Kohen, Z., & Saar, L. (2018)	Chemistry	428 – Israel	Gilbert's Models 2 and 4; Metacognition	Participants read adapted scientific articles on selected chemistry topics. The students were then involved in textual explanations, visual representation and self-monitoring tasks	Quasi- experimental design
Habig, S., Blankenburg, J., van Vorst, H., Fechner, S., Parchmann, I., & Sumfleth, E. (2018)	Chemistry	1253	Person-Object Theory of Interest (Krapp, 1999), RIASEC Model (Holland, 1997), Context- Based Learning Theory	Students read context-based texts describing topics like polluted drinking water and volcanoes. They then Rated the texts for familiarity.	Quasi- experimental design
Podschuweit, S., & Bernholt, S. (2017)	Physics	32 students.	Constructivist, leveraging diSessa's Knowledge-in- Pieces theory and Coordination Class Theory	Pre-test to assess baseline knowledge. Experimental tasks were conducted in pairs within a laboratory setting Post-test to evaluate learning gains and transferability	Experiment
Ummels, M. H. J., Kamp, M. J. A., De Kroon, H., & Boersma, K. Th. (2015).	Biology	21 students from a 10th- grade class in a semi- rural Dutch school	cultural- historical activity theory, influenced by Vygotsky's constructivist principles	Role Play: Students acted out family members debating the pros and cons of meat consumption.	Design-based research
Kang, J., Keinonen, T., Simon, S., Rannikmäe, M., Soobard, R., & Direito, I. (2018)	STEM Education	574 students	Stuckey et al.'s (2013) three- dimensional model of relevance; Hidi and Renninger's (2006) interest development model; Context- Based Learning (CBL)	Students read 25 career-related scenarios covering topics like energy, health, and environmental issues. The scenarios were developed to reflect individual, societal, and vocational dimensions of relevance.	Cross- sectional design

Effects of Scrum methodology on students' critical scientific literacy: the case of Green Chemistry	Chemistry	198 students	Vision III in Science Education. ered learning	Students were introduced to the socio-scientific issue: of choosing the greener synthesis of adipic acid. They analyzed two synthesis routes (using cyclohexanol or cyclohexene) and applied the principles of Green Chemistry.	Quasi- experimental design
van Vorst, H., & Aydogmus, H. (2021)	Chemistry	228	expectancy- value model of achievement motivation	Students worked individually on chosen tasks, involving identical chemical activities such as writing reaction equations.	cross-sectional survey design
Karsli Baydere, F. (2021)	Chemistry	38 (exp 20, control 18)	social constructivism	Students predicted outcomes related to real-life contexts (e.g., properties of polar and grizzly bears in cold environments).	Quasi- experimental design
Löffler, P., Pozas, M., & Kauertz, A. (2018)	Physics	178	Constructivist Framework; modeling theory	Students worked on a problem-solving task with varying contextualization, complexity, and transparency levels.	Experimental Design
Cabello, V. M., Moreira, P. M., & Griñó Morales, P. (2021)	Earth Science	22 (Chile)	sociocultural theory	Students engaged in an 18-hour learning using earthquakes and Tectonic Plate Theory (TPT) in which they drew explanations, engaged in group puzzles, and watched a video about earthquakes.	Exploratory (descriptive)
Fabien Güth, & Vorst, H.					
van. (2024) Edelsztein, V. C., Tarzi, O. I., & Galagovsky, L. (2020)	Chemistry	95 (Buenos Aires)	Sustainable Conscious Cognitive Learning Model (MACCS)	Students engaged in group discussion to explore diversity in responses to their prior knowledge	Quasi- experimental design
Eugenio- Gozalbo, M., Ramos- Truchero, G., Suárez-López, R., Andaluz Romanillos, M. S., & Rees, S. (2022)	Interdisciplina ry	55 (40 exp, 15 control)	socio- constructivist perspective; Experiential learning and sustainable education	Students engage in data interpretation using real-world data on seasonal food and agricultural practices.	Quasi- experimental design

Teshager, G., Bishaw, A., & Dagnew, A. (2021)	Interdisciplina ry	360-Ethiopia	pragmatism and heavily influenced by John Dewey's experiential learning theory.	Teachers identify and integrate real-life contexts into teaching. Regulation, Teachers adapt curriculum materials to align with local contexts available	cross-sectional survey design
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#### Domain Dominance

Three studies (Basso et al., 2018; de Putter-Smits et al., 2012; Dori et al., 2018) identified that chemistry emerges as the dominant domain in context-based learning (CBL) studies. The focus ranges from forensic chemistry activities to curriculum design and integrating scientific articles, showcasing its adaptability in real-world and academic contexts. Teachers developed context-based materials in biology, chemistry, and physics, with chemistry being most emphasized for its rich application potential. Forensic chemistry was also indicated to offer an engaging real-world connection in a six-year study.

#### **Prescriptive Context-Based Learning**

Studies by (Bahçivan, 2014; Chen et al., 2019; Demircioğlu et al., 2009) emphasized that context-based learning was implemented as a structured activity "done to" students rather than collaboratively designed, often limiting their autonomy and participation. Storyline-based teaching of the periodic table according to Demircioğlu et al. (2009) engaged students but remained prescriptive, focusing on content delivery. While Bahçivan, (2014) pointed out that physics lessons followed traditional approaches without laboratory activities, with students playing passive roles.

#### **Relevance and Real-World Connection**

Using real-world contexts to explain abstract scientific concepts enhances comprehension and engagement. Studies (Baran and Maskan, 2016; Cigdemoglu & Geban, 2015; Demelash et al., 2024) show students connect academic knowledge with everyday life through practical applications. News and multimedia sources bridged scientific concepts with real-world issues for high school students as reported by Baran and Maskan, (2016), Videos, simulations, and experiments contextualized chemical reactions and energy concepts among students in Cigdemoglu and Geban's, (2015) study. Also, in Demelash and colleagues (2024)'s study, real-world experiments and simulations helped students connect abstract Chemistry topics to their practical applications.

#### Learner-Driven Contextual Environment

Studies (Cabello, et al., 2021; Podschuweit and Bernholt, 2017; Ummels et al., 2015) affirm that inquiry-based and collaborative approaches empower learners to take control of their learning, promoting curiosity, teamwork, and problem-solving skills. In Cabello and colleagues (2021), earth science students engaged in group puzzles and video-based inquiry to explore tectonic plates, while biology students debated real-world issues like meat consumption through role-playing exercises, fostering critical thinking and collaboration in Ummels and colleagues, (2015)'s study. Physics experiments in pairs were reported to

encourage inquiry and knowledge transfer through hands-on tasks (Podschuweit & Bernholt, 2017).

# Exploring Students' Personal and Career Aspirations in Design

Contextual learning designs that align with students' career goals and personal motivations improve engagement and learning behaviours by connecting academic content to their aspirations were observed in (Habig et al., 2018; Kang et al., 2018; van Vorst & Aydogmus, 2021). In Kang and colleagues, (2018), career-related scenarios across STEM subjects linked academic concepts to societal and vocational relevance. Chemistry students related familiar context-based texts to career-oriented issues such as environmental challenges in Habig and colleagues' (2018) study. Also, tasks integrating real-life motivations, like writing chemical reaction equations according to van Vorst and Aydogmus, (2021) linked content to students' goals.

## Multiple Knowledge Presentation and Representation

Diverse forms of knowledge presentation, such as symbolic, macroscopic, and visual representations, along with collaborative projects, enhance students' comprehension and engagement in CBL environments as evidenced by (Cigdemoglu & Geban, 2015; Dori et al., 2018; Edelsztein et al., 2020).

Edelsztein and colleagues (2020) reported that chemistry students used group discussions and projects to explore diversity in conceptual understanding, and Gilbert's models incorporated textual, visual, and symbolic representations to explain Chemistry topics in Dori, et al., (2018)'s study. In Cigdemoglu and Geban, (2015) multimedia tools, videos, and experiments supported multi-representational learning of Chemistry topics.

# Context-Continuum Learning Design

The following studies (Chen et al., 2019; Demelash et al., 2024; Karsli Baydere, 2021; Teshager et al., 2021) identified that context-continuum learning combines everyday experiences and flexible transitions between physical and virtual learning environments for integrative learning.

Teshager and colleagues (2021) and Karsli Baydere, (2021) identified that in the living-Learning Continuum, curriculum materials adapted to students' local contexts enhanced relevance and understanding, and chemistry students connected principles like polar bears' adaptations to real-life examples.

For Physical-Virtual Continuum, VR-based training bridged virtual and physical operations, offering interactive experiences in CNC operations in Chen and colleagues' (2019)'s study, and Demelash and fellows (2024) reported that chemistry simulations integrated with real-world experiments provided seamless transitions between virtual and physical contexts their study report.

#### Discussion

Deconstructing complex abstraction through context in science education will require an exploration of how context-driven frameworks can address the challenges posed by

traditional science instruction. This section is structured into 3 following the research questions:

# What Contextual Articulation is Considered Important to Science Subjects

Chemistry emerges as a major domain for context-based learning (CBL), largely due to its apparent connection to real-world phenomena. Studies like Basso and colleagues (2018) illustrate how forensic chemistry captivates students through crime scene investigations, blending academic content with engaging scenarios. Similarly, de Putter-Smits and colleagues (2012) underscore the flexibility of chemistry to adapt to diverse contexts, positioning it as a dominant subject in CBL. These findings align with broader literature emphasizing the importance of chemistry in bridging scientific knowledge with societal relevance (Georgiou & Kyza, 2023; Hardy et al., 2021). However, while chemistry offers an array of real-world applications, other domains such as physics and biology often struggle to achieve similar contextual applications, as evidenced by Bahçıvan (2014), where traditional physics teaching limited student autonomy and engagement.

The integration of multimedia tools and simulations, as seen in Cigdemoglu and Geban (2015) and Demelash and colleagues (2024), provides another perspective on contextual articulation. By combining virtual and physical experiments, these studies highlight the power of multi-representational learning in demystifying complex abstractions. This approach is supported by studies emphasizing the value of interactive environments in promoting deep learning and the transferability of knowledge (Nykyporets & Ibrahimova, 2023). However, other studies argue that over-reliance on technology without direct hands-on experiences may dilute the authenticity of learning contexts (George et al., 2024; Srikanth, 2024).

Interdisciplinary approaches are also indicated to be essential in contextual articulation according to the results of this review. Ummels and colleagues (2015) employed role-play in biology to address societal issues, fostering critical thinking and collaboration. Similarly, Kang and colleagues (2018) leveraged career-related scenarios in STEM to align academic content with students' aspirations. These studies demonstrate how interdisciplinary and career-oriented contexts can heighten relevance and motivation, a view corroborated by broader research on inquiry-based learning.

Other studies however critiqued the prescriptive nature of CBL, where activities are imposed on students, as noted in Demircioğlu and colleagues (2009). The prioritization of learnerdriven contexts thus becomes essential, ensuring that students actively construct meaning from their experiences (Pastini & Lilasari, 2023). While chemistry remains a leading domain in contextual articulation, other disciplines must not be left out but challenged to innovate to achieve comparable contextual depth.

# How Context is Articulated in the Learning Design

Context articulation in learning design encompasses integrating real-world scenarios, interdisciplinary perspectives, and adaptive tools to enhance student's engagement and comprehension. The results of this study highlight how learning environments are constructed to connect abstract scientific ideas to relatable contexts. For instance, Chen and colleagues (2019) illustrate the use of (Virtual reality) VR-based environments to simulate CNC milling tasks, offering students the opportunity to practice detailed exercises across multiple stages.

This approach highlights the potential of virtual tools to bridge theoretical concepts and technical skills, a strategy supported by literature emphasizing the effectiveness of immersive technologies in skill-based learning (Pradhan, 2024; Sugiarto et al., 2024). However, such technology-based designs face critiques regarding accessibility, especially in resource-constrained schools, where the high cost of VR systems could limit widespread adoption (Kamat & Nasnodkar, 2019).

Similarly, Demelash and colleagues (2024) integrated real-world experiments with simulations, creating a dual-context learning environment where abstract chemistry concepts were made tangible through hands-on activities. This approach also reflects the notion that hybrid designs, combining physical and virtual elements, can foster deeper understanding and engagement (Hickey et al., 2020).

In addition, collaborative and inquiry-based contexts are prominently featured in the learning designs of many studies. Ummels and colleagues (2015) engaged students in role-play, where they debated societal issues such as meat consumption. This strategy, which promotes critical thinking and collaboration, aligns with inquiry-based pedagogies that place students at the centre of the learning process (Gholam, 2019). Likewise, in Cabello and colleagues (2021), students engaged in group puzzles and watched videos to investigate tectonic plate theory, blending interactive and visual learning methods. While such designs promote active participation, they also require careful facilitation to prevent uneven group dynamics, where some students dominate discussions while others remain passive (Lakey, 2020).

Another dimension of contextual articulation is integrating career-relevant scenarios into the learning design, as observed by Kang and colleagues (2018) and Habig and fellows (2018). Kang and colleagues (2018) presented 25 career-related STEM scenarios to align academic content with vocational relevance, echoing the ideas that underscore the motivational power of career-contextualized education (Bogush, 2016). Similarly, Habig and colleagues used familiar context-based texts, such as those related to environmental challenges, to demonstrate how students can link abstract science concepts to their aspirations. This approach addresses critiques that traditional curricula often fail to reflect students' lived experiences (Scott & Husain, 2021).

Prescriptive designs, however, offer a contrasting view to these learner-centered approaches. Bahçıvan (2014) noted that physics lessons often relegated students to passive roles, with minimal laboratory interaction, while Demircioğlu and colleagues (2009) employed storylinebased instruction that, while engaging, underscored rigid learning pathways. These findings reflect broader concerns about the effectiveness of top-down instructional designs, which have been critiqued for limiting students' creativity and learning process (Ciani et al., 2008). By contrast, co-constructed learning designs offer a more flexible approach, enabling students to shape their educational experiences actively.

# What Emergent Design Principles Can Be Derived From the Context-Continuum Model to Support Authentic Science Learning in Secondary Schools

The context-continuum model provides a versatile framework for science education by incorporating students' everyday experiences with flexible, diverse learning environments (Dimitrov et al., 2014). This duality between real-life and virtual contexts promotes meaningful connections, deeper learning engagements, and improved conceptual understanding in science education. An emergent design principle identified is leveraging

students' lived experiences to build scientifically relevant knowledge, as seen in Teshager and colleagues (2021) and Karsli Baydere (2021). Teshager and colleagues (2021) highlighted how localized curriculum adaptations aligned with students' cultural and social contexts enhanced the relevance of abstract scientific principles. Similarly, Karsli Baydere's (2021) study demonstrates the effectiveness of incorporating relatable examples, such as "polar bear adaptations to cold", to make complex biological and chemical concepts more tangible. This resonates with the Living-Learning Continuum, which emphasizes grounding science in familiar contexts to make abstract ideas accessible (Barber, 2023). However, excessively localized designs may risk reducing the universality of scientific principles, limiting students' exposure to global scientific issues (Muraile, 2019).

The Physical-Virtual Continuum, another aspect of the model, introduces immersive, technology-enhanced environments to facilitate integrative learning. Chen and colleagues (2019) exemplify this with a VR-based training system for CNC operations, enabling students to practice technical skills interactively. Similarly, Demelash and colleagues (2024) integrate real-world chemistry experiments with simulations, allowing seamless transitions between virtual and physical environments. These designs align with existing literature advocating for hybrid learning environments that cater to diverse learning preferences and foster engagement through multimodal representation (Dikilitas & Fructuoso, 2023; O'Ceallaigh et al., 2023). However, challenges such as accessibility gaps, technological reliability, and teacher readiness remain significant barriers to widespread implementation (Alvarez, 2020). Collaborative inquiry is another important design principle. Cabello and colleagues (2021) in their study engaged students in group activities, such as puzzles and discussions, to explore tectonic plate theory. These tasks encouraged active participation, problem-solving, and peer learning, supporting previous evidence that collaborative inquiry promotes critical thinking and deeper understanding among students (Yu et al., 2024). A shortcoming however is that poorly facilitated group dynamics can hinder the intended learning outcomes, with some students dominating tasks while others disengage (Juvonen et al., 2019).

The integration of contextually relevant career and societal issues is also another key design principle derived from the context-continuum model. In Kang and colleagues (2018), career-related STEM scenarios bridged the gap between students' aspirations and academic content, creating a strong motivational framework for learning. Similarly, Habig and colleagues (2018) employed environmental challenges to connect chemistry concepts to real-world contexts, emphasizing the societal relevance of science. Also, effective context-continuum designs, such as those in Teshager and colleagues (2021) and Demelash and fellows (2024), highlight the need for environments that accommodate diverse learners and transitions between real-world and virtual settings. However, achieving such adaptability demands significant teacher preparation, resource availability, and curriculum alignment.

# Limitations

This systematic review has provided critical insights into the deconstruction of complex abstraction through context in science education. It identified areas like domain dominance, prescriptive context-based learning, relevance and real-world connection, learner-driven contextual environment, exploring students' personal and career aspirations in design, multiple knowledge presentation and representation and context-continuum learning design that are vital to achieving abstract deconstruction. However, this review being a part of an ongoing research, the authors do not claim the area identified is exhaustive. Bias of any form

is also an anticipated limitation, especially for systematic reviews, however, this was remedied by adhering rigorously to the research methodology and ensuring that the selected articles underwent an in-depth peer review process.

#### **Implications for Practice**

The outcome of this review stresses significant insights that can be applied to address abstract scientific concepts in schools. A major implication is the necessity of bridging abstract content with students' lived experiences. Teachers, school administrators and curriculum developers should actively integrate localized contexts that reflect students' cultural and social realities, as demonstrated in Teshager and colleagues (2021) and Karsli Baydere (2021). This approach not only enhances assimilation but also encourages students to see science as directly applicable to their lives, hence promoting engagement and motivation. The use of hybrid environments, combining physical and virtual learning spaces is also another essential implication. Chen and colleagues (2019) and Demelash and fellows (2024) reveal the value of blending real-world experiments with simulations to create seamless transitions between theoretical understanding and practical application. This suggests that schools must invest in technological tools and teacher training to implement effective hybrid models, although accessibility challenges must be addressed to ensure equity. Inquiry-based and collaborative learning models are pivotal for empowering students to take ownership of their learning processes. Evidence from Ummels and colleagues (2015) and Cabello and fellows (2021) highlights how role-playing, group discussions and problem-solving activities promote critical thinking, teamwork, and deeper learning. Teachers should adopt these strategies while ensuring facilitation methods that prevent passive participation or dominance by specific individuals in group settings.

#### Conclusion

To meet the many challenges of abstraction in science education, the design of context-based learning must be anchored in principles that promote relevance, engagement, and adaptability. Central to this is the Context-Continuum Learning Design, which emphasizes the seamless integration of real-world experiences with both physical and virtual learning environments. By allowing students to navigate between tangible and digital contexts, this approach supports a deeper understanding of abstract scientific concepts while catering to diverse learning preferences and needs. Equally important are Socio-cultural Justifications, which ground science education in the cultural, social, and economic realities of students. Contextualizing science through culturally relevant examples ensures that abstract concepts are accessible and meaningful, fostering inclusivity and validating the lived experiences of all learners. This transforms science from an abstract discipline into a dynamic and relatable field that resonates with students' backgrounds and communities. Another essential component is Student Agency, which shifts the focus from prescriptive, teacher-centred methods to learner-driven approaches. By empowering students to actively participate in their learning, through inquiry-based exploration and collaborative problem-solving, science education can become a space for creativity, critical thinking, and self-direction. This fosters a sense of ownership and engagement, enabling students to connect more meaningfully with the subject matter. Further, a connection to real life and the real world remains critical in demystifying abstract scientific concepts. By linking lessons to everyday experiences, societal challenges, and potential career pathways, teachers can inspire students to see the practical value and implications of science in their lives. This not only enhances motivation

but also prepares students to apply their knowledge to real-world problems and global challenges.

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# The Perception and Use of Vocabulary Learning Strategies Among Non-English Majors at HUTECH University

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#### Abstract

The study investigates students' perceptions and students' use of vocabulary learning strategies (VLS) among non-English majors at Ho Chi Minh City University of Technology (HUTECH). Three main issues addressed are (1) to determine students' perception in terms of their awareness and the level of the importance of vocabulary learning strategies; (2) students' use in terms of frequency and preference; (3) the correlation between students' perception in terms of the level of the importance of vocabulary learning strategies and their use in terms of frequency. Mixed method is applied in this investigation; additionally, questionnaires focus on social group, memory group, cognitive group, and metacognitive group with 350 sophomores from four different majors, and 10 sophomores are invited in structured interview. The results showed that the vocabulary learning strategies of the current study were well-aware. All those strategies were perceived importantly in learning vocabulary and four groups of vocabulary were used frequently. Students' responses in terms of preference also confirmed students' use in terms of frequency. On the other hand, students' perception correlated with students' use in only cognitive group of vocabulary learning strategies, but not the three others.

Keywords: Vocabulary Learning Strategies, Students' Perceptions, Students' Use, Mixed Methods, Non-English Majors

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#### Introduction

According to the Education First English Proficiency Index (EF EPI) in 2024, Vietnamese people's proficiency in using English is assessed at low proficiency, ranking at 63<sup>rd</sup> out of 116 countries and religions. In Asia, Vietnam ranked the 8<sup>th</sup> position out of 23 countries and regions. Therefore, enhencing the proficency in using English is very essential for Vietnamese learners. With the inevitable turning points of nation's development and a government undertaking to enhance English as the second language in Vietnam education system (Le, 2024), the role of English is highly assessed and emphasized as a pivotal mission in the historical era.

However, according to Dinh (2011), EFL students, undeniably, usually stick to common practices: (1) concentrating on word lists provided by their teachers; yet, they are normally unable to complete the list since they are not sufficiently motivated; (2) having no successful strategies to learn vocabulary or lacking effective application of vocabulary for outside classroom activities or even inside classroom situations. In fact, English teachers' evaluations and students' achievement in English subject recently show that the most salient issue is the lack of vocabulary of students. Moreover, the major problem encountered practically by students that teachers of English have been concerned about for years is deficient vocabulary (Mumary, 2017). Due to their inadequate word knowledge, students usually struggle to deal with performing the skills of English, even when they are provided with progressive English language education. It cannot be denied that vocabulary plays an important role in learning English; nevertheless, little is known about student's perceptions and students' use towards vocabulary learning strategies researches in the context of HUTECH.

Therefore, this study seeks to obtain comprehensive data which would help to address the issues regarding vocabulary learning strategies, an investigation on vocabulary learning strategies is necessary to consolidate students' vocabulary acquisition as well as enhance students' vocabulary size with the following questions:

- (1) How do non-English major students in HUTECH perceive vocabulary learning strategies in terms of awareness and the level of importance of the strategies?
- (2) How do non-English major students in HUTECH use vocabulary learning strategies in terms of frequency and preference?
- (3) What is the correlation between students' perception and their use of vocabulary learning strategies?

Practically, the findings could make important contributions to raising students' awareness in vocabulary learning strategies and expected to extend students' recognition for strategies applied in vocabulary learning. Furthermore, with the data collected, the investigation is also beneficial for English teachers to review their strategies in vocabulary teaching and determine their students' strategies in vocabulary learning, from which teachers can adapt their instruction or revise their syllabi in English language teaching. They could employ effective approaches in helping students to improve their English language in general and vocabulary learning in particular. Theoretically, the findings may provide additional evidences with respect to language researchers for references in relating to the perception and use of vocabulary learning strategies.

# Literature

In order to achieve fluent level in four language skills in English (listening, reading, writing, and speaking), vocabulary is asserted to be "the core or heart of language" (Lewis, 1993, p. 89). Additionally, Nation (2001) stated that language use is enabled by knowledge of vocabulary; conversely, vocabulary knowledge leads to an increase in language use. Furthermore, Nation (1990) argues that a learner should know approximately 2,000 to 3,000 words for using English effectively. Furthermore, in order to read in advanced, authentic and academic contexts, a learner is required to have at least 5,000 words (Hirsh & Nation, 1992). Similarly, Schmitt (2000) also agrees that 5,000 words are a necessary limit to become a better English learner. Consequently, learning and enhancing vocabulary effectively is a tremendous challenge for English learners in general and non-English majors in particular. Understanding this kind of students' obstacle, many researchers (Oxford, 1990; Nation, 1990; Stoffer, 1995; Gu & Johnson, 1996; Kudo, 1999; Schmitt, 1997, 2000; Istvan, 2016) have been creating vocabulary learning strategies to help students learn vocabulary more effectively in order to develop the source of vocabulary needed for their language proficiency.

In this study, the thesis researcher adopts Schmitt's vocabulary learning strategies (1997) with the limitation of four groups for the questionnaire in investigation because the version in 1997 was adequate and similar with students' activitives in HUTECH recently. Firstly, memory strategies, the phrase "memory strategies" is abbreviated to "MEM" and known as mnemonics. These strategies relate to previous learned words or experiences, images of word form or meaning, and activities of memorable process (Schmitt, 2000). Secondly, cognitive strategies (COG), Oxford (1990) identifies cognitive strategies that are "manipulation or transformation of the target language by the learner" (p. 43). Cognitive strategies are similar to memory strategies but elaborative mental process is not the main remark. Repetition and mechanic are employed instead (Schmitt, 2000). Thirdly, the group of metacognitive strategies (MET), these strategies are considered as methods to review and evaluate students' word knowledge in learning process generally (Schmitt, 2000). In particular, the activities include English-language media, spaced word practice, word self-testing, skipping or passing new words, studying new word over time, and vocabulary knowledge assessment at the end of a semester, a course or after a period of time are integrated in the process. Finally, social strategies, Schmitt (2000) argues that social strategies (SOC) comprise activities to interact with other people such as teachers, classmates, friends, foreigners or anyone for enhancing word knowledge.

In the Vietnamese setting, vocabulary teaching and learning also attracts considerable attention from the local language scholars (e.g., Tran, 2008; Le, 2009; Le, 2010; Nguyen, 2012; Nguyen, 2013) in teaching and learning of English as a Foreign Language (EFL).

The conceptual framework of the current study is illustrated by the figure below.



Figure 1: The Conceptual Framework of the Current Study

# Methodology

Mixed methods approach is a combination of quantitative and qualitative data because with this design "words, pictures, and narrative can be used to add meaning to numbers" (Johnson & Onwuegbuzie, 2004, p. 21). Nagy and Scott (2000) also agree that "qualitative data (words, pictures, and narrative) combined with quantitative, numerical data from a larger-scale study on the same issue allow the generalization of our research results for future studies and examinations" (p. 3). Furthermore, McKim (2017) affirms "studies that use a mixed methods approach gain a deeper, broader understanding of the phenomenon than studies that do not utilize both a quantitative and qualitative approach" (p. 203). In the current study, specifically, students' perception towards vocabulary learning strategies, and students' use of vocabulary learning strategies were explored under quantitative researches with two questionnaires. Furthermore, qualitative research was conducted to recognize students' use in terms of preference and their own VLS with individual interviews. By doing so, students' strategies in learning vocabulary of non-English majors in HUTECH were obviously discovered in full details.

The present study employed convenience sampling due to the time constraint and the researcher could not involve all of the non-English majors studying at HUTECH. Because the sample is difficult to choose, convenience sampling which is based on the availability of a group of individual conveniently taking part in the study is suggested in the case (Fraenkel & Wallen, 2008). According to Comrey and Lee (1992), the sample size with distinct scale as 100 = poor, 200 = fair, 300 = good, 500 = very good, 1000 and over = excellent (as cited in Matsunaga, 2010), the number of participants in the current study could be considered to be good sampling scale. Furthermore, non-English majors sophomore were selected as the sample for the current investigation. It is believed that after one year studying at tertiary level, sophomores have experienced certain English learning strategies applied by themselves or by their classmates; particularly vocabulary learning strategies and may plan or prepare to plan some for themselves. Thus, the sophomores can be considered to be a suitable sample for the study. After piloting, in the first semester, questionnaire 1 with 350 copies questionnaires were delivered to students from five different classes: Business Administration, Marketing, Pharmacy, and Mechanical and Electronic Engineering. The time allowance for the students to fill in the questionnaire was 20 minutes. In the second semester, questionnaire 2 with 350

copies were delivered to students from the same five classes as in the first semester, with 20 minutes to fill in the questionnaire.

On the dimension of quantitative paradigm, the study applied close-ended five-option Likertscale questionnaire to query students' perception and students' use of vocabulary learning strategies. The quantitative data collected from the questionnaire were processed by the regression analysis with principal component analysis to extract the main strategies to understand students' awareness, students' perception, and students' use in term of frequency towards each of vocabulary learning strategies. There were two sets of questionnaires based on four groups of Schmitt (1997)'s vocabulary learning strategies (MEM, COG, META, SOC). Questionnaire 1 delivered at the beginning of first semester to determine students' awareness and the importance of vocabulary learning strategies. After finishing questionnaire 1, students were encouraged to apply strategies in questionnaire 1 in learning vocabulary. At the end of the first semester, students participated in questionnaire 2 to recognize their frequency and preference towards the vocabulary learning strategies offered in questionnaire 1. Among 58 vocabulary learning strategies of Schmitt (1997), the thesis researcher chose 19 strategies which were surveyed regularly in previous studies and close to students' vocabulary learning activities recently (Stoffer, 1995; Gu & Johnson, 1996; Schmitt, 1997; Kudo, 1999; Lin, 2001). Besides, 5 strategies were added more in the questionnaires after the thesis researcher had a conversation with students about how students have learned vocabulary recently. They are "connect new word with previous words" (MEM), "image position of letters in new word" (MEM), "learn word meaning with picture" (COG), "use applications in smart phone" (COG), "search information in English websites" (META).

On the other hand, to collect the qualitative data, 10 sophomores included 5 ones from Business Administration major, 2 ones from Marketing major, 2 ones from Pharmacy, and one from Mechanical and Electronic Engineering participated in face-to-face individual interview. After investigating questionnaire 2, interview was implemented with one by one sophomores for qualitative research with both writing and recording, from five to thirteen minutes for each one. Furthermore, the sophomores participated in interview were different from students of main survey. On the dimension of qualitative paradigm, structured individual interview was applied in the current thesis to carry out students' preference towards vocabulary learning strategies. Because students could provide their own opinions, feelings, experience and the researcher could control the questions for students (Crewell, 2014). The interview protocol comprised 5 open-ended questions to explore students' use and preference towards vocabulary learning strategies. Furthermore, the interview protocol was piloted with 2 random students to ensure students' understanding about five questions before the individual face-to-face interviews were conducted with 10 students to collect the qualitative data.

Cronbach's alpha is a reliability coefficient that indicates how well the items are positively correlated one another. George and Mallery (2003) stated that if the Cronbach's alpha value is lower than 0.700, the correlation statistics of item-total is processed to eliminate the items which make the result unacceptable. The process is kept running until the valuable of Cronbach alpha is acceptable. On the other hand, if the Cronbach's alpha value is higher than 0.900, the correlation statistics of item-total is run to carry out the most correlative item with others. Furthermore, Wang, Batt, Kessler, Neff, Iyer, Cooper and Kempton (2017) consider item-total correlation statistics as the contribution of each item to instrument consistency. Kumar (2015) confirms item-total correlation should be reckoned to decrease bias in the investigation significantly. In addition, Field (2009) demonstrates if any item' values are less

than 0.3 in correlation, they would be eliminated; in contrast, those ones are acceptable for further steps.

#### Results

# Research Question 1: How do non-English major students in HUTECH perceive vocabulary learning strategies in terms of students' awareness and the level of importance of the strategies?

# a. Students' Awareness of Vocabulary Learning Strategies

First of all, students' awareness of four groups of vocabulary learning strategies were described with mean values. In cognitive group, students believed that "use applications in smart phone" was aware fully (mean = 4.51). Otherwise, "put English labels on physical objects" was aware slightly (mean = 2.94). Among strategies of metacognitive group, "search information in English websites" was well-aware (mean = 4.04) while "read English news (paper/online)" was aware with lower level than others (mean = 3.44). In the group of social strategies, "ask teacher for a sentence including new word" and "participate in group activities" were well-aware with the values of mean such as 4.09 and 4.04. Finally, all strategies in memory group were at the level of moderate awareness; for instance, "connect new word with previous words" (mean = 3.68) and "write a sentence with new word" (mean = 3.47).

In summary, students were aware of all vocabulary learning strategies. Additionally, the strategies that received the highest level of awareness were "use applications in smart phone" (COG), "keep a vocabulary notebook with different topics" (COG), and "picture presents word meaning" (COG).

# b. Students' Perception in Terms of the Level of Importance of VLS

The effect of each item in each group of vocabulary learning strategies presented different values. The values of mean in the descriptive statistics approach prove that students perceived "repeat words orally" as the most important strategy in the cognitive group (COG), "read English news (paper/online)" as an important strategy in the metacognitive group (MET), "ask teacher for synonym of new word" as the most essential strategy in the social group (SOC) and "say new word aloud when studying" as a very important strategy in the memory group (MEM). Otherwise, while cognitive group (COG), social group (SOC), and memory group (MEM) were very important, metacognitive group (META) was at the level of importance. In addition, within four groups of VLS, students perceived memory group (MEM) that was more important group than three others with 4.30 of the average mean value (very important). The important level of the items within four groups of VLS was demonstrated in Table 1 as follows:

• •

	Mean
04 - COG - Put English labels on physical objects	3.60
05 - COG - Picture presents word meaning	4.17
08 - COG - Use flash cards	3.97
09 - COG - Keep a vocabulary notebook following A, B, C, letter	4.12
10 - COG - Keep a vocabulary notebook with different topics	4.10
11 - COG - Repeat words orally	4.23
14 - COG - Take notes in class	4.00
24 - COG - Use applications in smart phone	4.03
Average Mean	4.03
01 - MET - Search information in English websites	3.65
07 - MET - Watch English news (television/radio)	3.71
15 - MET - Watch English television programs	3.73
17 - MET - Read English news (paper/online)	3.92
20 - MET - Watch English movies	3.26
Average Mean	3.65
02 - SOC - Ask classmates for meaning	4.01
03 - SOC - Participate in group activities	4.01
06 - SOC - Ask teacher for an L1 translation	4.04
16 - SOC - Participate in English clubs	4.14
18 - SOC - Ask teacher for synonym of new word	4.20
19 - SOC - Ask teacher for a sentence including the new word	4.15
Average Mean	4.09
12 - MEM - Connect the new word with previous words	4.34
13 - MEM - Say new word aloud when studying	4.44
21 - MEM - Write a sentence with new word	4.16
22 - MEM - Image position of letters in the word	4.30
23 - MEM - Learn a sentence that has new word	4.28
Average Mean	4.30

# Table 1: The Important Level of the Strategies

# Research Question 2: How Do Non-English Major Students in HUTECH Use Vocabulary Learning Strategies in Terms of Frequency and Preference?

# a. Students' Use of Vocabulary Learning Strategies in Terms of Frequency

The effect of each item in each group of vocabulary learning strategy presents different values. In the group of cognition strategies, the frequent levels of the items are demonstrated in figure and tables as follows. In figure 2, there was a general view of frequent use of strategies in cognitive group. As can be seen, the level of frequency in cognitive group reached from "moderately frequent" to "very frequent". Most of all, 8 strategies were highest at "frequent" level of use. Regarding table 4.15, the majority of students used "keep a vocabulary notebook with different topics" strategy (mean = 4.1657). On the other hand, "use flash cards" strategy was not used frequently than others (mean = 4.1200).



Figure 2: The Frequent Use of Cognitive Strategies

Figure 3 showed that most of students used "search for information in English websites" strategy frequently. Furthermore, among 5 strategies of metacognitive group, a significant number of students applied the strategy "watch English movies" in the group of very frequent level.



Figure 3: The Frequent Use of Metacognitive Strategies

Regarding metacognitive group (MET), the frequent level of use of 5 items was also frequent. The number of students used "watch English movies" strategy was the most (mean = 4.2971). Otherwise, "read English news (paper/online)" strategy was not used frequently than others (mean = 3.8800).

Different from cognitive group and metacognitive group, the majority of students used 6 strategies of social communication group very frequently. In the level of very frequent use, "ask teacher for an L1 translation" strategy was used in the most. Then, "ask classmate for meaning" strategy, "participate in group activities" strategy, and "ask teacher for a sentence including the new word" strategy were also applied very frequently.



Figure 4: The Frequent Use of Social Strategies

In social communication group (SOC), the frequent level of use of 6 items was very frequent. "Ask teacher for an L1 translation" strategy was used mostly (mean = 4.4514). Otherwise, "participate in English clubs" strategy was not used as much as others (mean = 4.2714).



Figure 5: The Frequent Use of Memory Strategies

As shown in Figure 5, a significant number of students utilized memory strategies frequently. In addition, the number of students used "write a sentence with new word" strategy was higher than the others. The number of students used "write a sentence with new word" strategy was the most (mean = 3.9800). In contrast, "learn a sentence with new word" strategy was not used frequently than others (mean = 3.7229).

#### b. Students' Use of Vocabulary Learning Strategies in Terms of Preference

Regarding favorite vocabulary learning strategies, ten students preferred social strategies for learning new words. It absolutely supported students' use in terms of frequency that was presented above. It also meant that students' preferable vocabulary learning strategies were used frequently. Specifically, all ten students prefer social strategies as "ask teacher for synonym of new word", and "ask classmates for meaning". For instance, "I usually ask teacher synonyms of new word for guessing its meaning" (Student 3, 4, 5, 7, 9 said) or "ask classmate next to me or those ones in a group for new word's meaning" (Student 2, 4, 7 said). Next, cognitive strategies that reached second choice were "use applications in smart phone", and "repeat words orally". For example, "I spend a lot of time in smart phone, I also learn

vocabulary in English applications in smart phone" (Student 1, 2, 3, 5, 8, 9, 10 said); "I usually repeat orally when I learn new words" (Student 1, 2, 9, 10 said). Finally, memory strategies were not preferred as others. Because only Student 3 preferred a strategy of memory group as "say new word alound when studying" for learning vocabulary. Student 3 said "I often learn vocabulary at home where I can say new words alound in my room for memory".

# Research Question 3: Is There Any Correlation Between Students' Perception in Terms of the Level of Importance of VLS and Students' Use in Terms of Frequency?

First of all, both the students' perception in terms of the level of the importance of VLS and students' use in terms of frequency were examined by questionnaire with five-option Likert scale. Therefore, the correlation between students' perception in terms of the level of the importance of VLS and students' use in terms of frequency was recognized with each group of vocabulary learning strategies (COG, MET, SOC, MEM). Furthermore, the correlation of each group was determined by the value of significance firstly, and then the value of of Pearson. According to Cohen (1988), if the value of significance is smaller than 0.05, there is a correlation between students' perception and students' use in a participate group. If the value of significance is larger than 0.05, there is not correlation between students' perception and students' use, the value of Pear (r) will be considered the level of the correlation between students' use. Strong correlation has value from 0.70 < r < 1.00; medium correlation is from 0.40 < r < 0.70; and weak correlation has value from 0.10 < r < 0.40.

Regarding the group of cognitive strategies, the value of significance showed that students' perception correlated with students' use (sig < 0.05). Moreover, students' perception had strong correlation with students' use (0.70 < Pearson's r < 1).

# Table 2: The Correlation Between Students' Perception and Students' Use of Cognitive Strategies

		COG - Students' perception	COG - Students' use		
COG - Students' perception	Pearson Correlation	1	,882*		
	Sig. (2-tailed)		,000		
COG - Students' use	Pearson Correlation	,882*	1		
	Sig. (2-tailed)	,000			
* O = 1 + 1 + 1 + 1 + 1 + 1 + 0 + 0 + 1 + 1 +					

\* Correlation is significant at the 0.01 level (2-tailed).

On the other hand, in the metacognitive group, there was not significant correlation between students' perception and students' use because the value of significance was 0.230. Therefore, the value of Pearson had not meaning even its equal 0.961.

## Table 3: The Correlation Between Students' Perception and Students' Use of Metacognitive Strategies

		MET - Students' perception	MET - Students' use
MET - Students' perception	Pearson Correlation	1	,961 <sup>*</sup>
	Sig. (2-tailed)		,230
MET - Students' use	Pearson Correlation	,961 <sup>*</sup>	1
	Sig. (2-tailed)	,230	

\* Correlation is significant at the 0.05 level (2-tailed).
Similar to metacognitive group, there was no correlation between students' perception and students' use in social group of vocabulary learning strategies (sig = 0.120).

#### Table 4: The Correlation Between Students' Perception and Students' Use of Social Strategies

		SOC - Students' perception	SOC - Students' use
SOC - Students' perception	Pearson Correlation	1	,753*
	Sig. (2-tailed)		,012
SOC - Students' use	Pearson Correlation	,753*	1
	Sig. (2-tailed)	,012	

\* Correlation is significant at the 0.05 level (2-tailed).

Finally, there was no correlation between students' perception and students' use in memory group of vocabulary learning strategies (sig = 0.853).

#### Table 5: The Correlation Between Students' Perception and Students' Use of Memory Strategies

		MEM - Students'	
		perception	MEM - Students' use
MEM - Students'	Pearson Correlation	1	,753*
perception	Sig. (2-tailed)		,853
MEM - Students' use	Pearson Correlation	,753*	1
	Sig. (2-tailed)	,853	

\* Correlation is significant at the 0.05 level (2-tailed).

In summary, students' perception in terms of the level of importance of VLS and students' use in terms of frequency had a strong correlation in group of cognitive strategies. It meant not only students perceived that cognitive strategies were very important but they also used cognitive strategies more frequently. Conversely, students perceived that memory strategies were the most important while they did not use memory strategies frequently in learning vocabulary. Finally, the findings showed that there was a gap between students' perception in terms of the important role of VLS and students' use in terms of frequency with metacognitive strategies group (MET), social strategies group (SOC), and memory strategies group (MEM).

#### Discussions

Vocabulary learning strategies were a significant issue from 1990 and many researches were published by famous researchers. However, as time goes by, vocabulary learning strategies of frequent use in the current study showed that students had a tendency to apply technology to learn vocabualry as "use applications in smart phone" (COG) or "watch English movies" (MET). Definitely, "use applications in smart phone" (COG) and "watch English movies" (MET) were prefer mostly among vocabulary learning strategies. It meant that in the development of high technology, as a trend, strategies related to products of hi-tech would be used more than others. Because those strategies are interesting and convenient to help students learning vocabulary outside of classroom effectively.

On the other hand, the correlations between students' perception in terms of students' opinion of the level of importance of VLS and students' use in terms of frequency were not fully congruent. Students' perception correlated with students' use in only cognitive group of VLS. However, there were not a strong correlation between students' perception and students' use

in metacognitive group, social group, and memory group of VLS. It meant that students realized the importance of VLS but they did not used those strategies frequently.

The results of perceptions towards vocabulary learning strategies in this study were similar to the research of Asyiah (2017). The strategies were well aware and students agreed that vocabulary learning strategies were important in vocabulary learning process. There was also a comparison between Schmitt's survey (1997) and the current investigation.

Detween Seminit's Survey (1997) and the Cartent Investigation				
Strategy Groups	Schmitt's survey (1997)	The current investigation		
Metacognitive strategies	Metacognitive strategies (none)			
Cognitive strategies	Verbal repetition	Keep a vocabulary notebook with different topics		
Social strategies Ask classmates for meaning		Ask teacher for an L1 translation		
Memory strategies	Say new word aloud	Write a sentence with new word		

Table 6: The Most Used Strategies in Four Groups Between Schmitt's Survey (1997) and the Current Investigation

A significant difference between Schmitt's research and the current study. Schmitt's research had not the most used strategy in metacognitive group. There were only the most used strategies in other groups. Table 6 illustrated that three significant strategies in Schmitt's survey were "verbal repetition" strategy (COG), "ask classmates for meaning" strategy (SOC), and "say new word aloud" strategy (MEM). In contrast, there were the most used strategies in four groups. Moreover, four significant strategies in the current study were "watch English movies" (MET), "keep a vocabulary notebook with different topics" (COG), "ask teacher for an L1 translation" (SOC), and "write a sentence with new word" (MEM). Although there were differences between Schmitt's research and the current study, vocabulary learning strategies (COG, MET, SOC, MEM) surveyed in the current study were used frequently by non-English major sophomores in HUTECH.

#### Conclusion

The investigation was conducted to recognize vocabulary learning strategies of non-English majors. Firstly, the results of the study proved that students were well aware of vocabulary learning strategies. Hence, students should consider suitable vocabulary learning strategies to enhance vocabulary knowledge and use them frequently. Secondly, students tend to apply techology in learning vocabulary as "use applications in smart phone" strategy. It means that English teachers should consider teaching approaches related to students' trend as well as give students advices about valuable applications in smart phone. Moreover, students usually combine or use multi-strategies in learning vocabulary such as "look up dictionary", "go to travel", "watch English videos in youtube chanel", "learn new word from lyric of English song", "learn new word from subtitle of English movies", "learn new word from English pages on facebook application". Thirdly, regarding congruent correlation between students' perception and students' use, students should concerntrate on strategies applied frequently for learning vocabulary because all vocabulary learning strategies were considered very important.

On the other hand, the limitation of the study is persisted obviously. Firstly, due to practical constraints, this study does not provide a comprehensive review of lexical issues. Hence, it

mainly concentrates on students' perceptions and students' use of vocabulary learning strategies within memory strategies (MEM), cognitive strategies (COG), metacognitive strategies (MET), and social strategies (SOC). Secondly, the target sample in this investigation is focused on sophomores of non-English majors at HUTECH and students of other levels are not involved in the study.

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#### Transformative Design: Virtual Reality and Augmented Reality in Furniture Design –A Comprehensive Analysis of an Immersive Learning Experience

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The Barcelona Conference on Education 2024 Official Conference Proceedings

#### Abstract

Virtual Reality (VR) and Augmented Reality (AR) are advanced technologies in continuous development. They are already involved in different fields including Academia, for immersive and interactive learning experiences. They are mainly applied to STEM disciplines such as Science, Mathematics, Engineering, and Medicine. This qualitative study aims to examine the integration of VR and AR in an undergraduate Furniture Design course while understanding its impact on the learning experience, the design process, and active learning methodologies. Sixteen junior-level interior design students at the American University in Dubai, UAE developed a piece of furniture project and 3D printed prototype. Following research, some included VR and AR-based approaches, while others adopted typical methods. The faculty member assessed the study through a comprehensive analysis of process and outcomes, comparative evaluations, observations, interviews, literature review, and a survey. The findings indicate that the integration of advanced technologies benefits the design process. Key elements are real-time and real-based design visualizations, user experience for fast customization, human-scale projects for a better understanding of proportions and ergonomics, and the transformation of the learning experiences by creating immersive, interactive, and engaging learning environments. Moreover, VR and AR-based learning activities facilitate collaborative work and active learning; they promote creativity, and technical skills. The limitations involve technological advancements, accessibility to training, equipment, and financial issues. In conclusion, applying VR and AR in the design process supports the design itself and future designers' abilities. A balanced adoption of these technologies in Academia leads to pioneering teaching practices linked to industry requirements.

Keywords: Virtual Reality, Augmented Reality, Furniture Design, Immersive Learning, Transformative Design

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#### Introduction

Innovative technologies involving daily life and workplace activities continue to emerge. Their application encompasses fields such as STEM disciplines, biology, the medical sector, and engineering. Virtual Reality (VR) is the 3D simulation of environments or elements interacting with the individual through dedicated equipment. It creates a virtual environment for an immersive experience. Augmented Reality (AR) allows the interaction of computer-generated 3D virtual elements with the real world through applications, software, and dedicated equipment; it may include additional sensorial components linked to touch, hearing, and smell senses. The same technologies are applied to various fields, including Design.

#### **Background & Context**

#### **1. Design Process Phases**

Design is an extremely dynamic area where creativity and technical advancements work together to benefit the entire sector. Many technological tools have been developed and implemented in recent years. From the wide revolution of computer-generated tridimensional visualizations and the introduction of two-dimensional drawing software such as CAD and similar, we are currently experiencing an innovative, impactful transformation by introducing VR and AR in Design, involving all the phases of the design process.

According to Voinea and Opincariou: the creative process does not exclude information of knowledge. It implies a strong relation between critical and creative thinking (Voinea, Opincariou, 2020).

Traditionally, the phases of the interior design process in practice include:

Assessment and Research Preliminary Design & Schematic Planning Conceptual Design Design Development Working Drawings & Specifications Site Supervision (optional)

In detail, **Assessment and Research** include a brief with the client, brainstorming, consultation, study of the client's needs, expectations, and requirements, initial program as a result of the activities of research, organization and solution options, initial sketches and perspectives, proposal, and programming.

**Preliminary Design & Schematic Planning** involve preliminary drawings showing schematic planning, progressively including the client's comments, if any. This phase comprises studying and understanding space, as well as its characteristics and critical elements. It includes the evaluation of the layout according to the location and its requirements, considerations about window orientation and relation to light, overall view, potential noise issues, elements to modify, and finally, space planning.

**Conceptual Design** represents the passage from idea to realization. Based on approved schematic plans and the client's comments, the designer finalizes the conceptual floor plans and related drawings along with the Mood Board and initial material selection and Material

Board. Consequently, the design is refined and detailed, with the elaboration of schedules, the selection of Finishes, Furniture & Equipment (FF&E), and the budget completion.

During **Design Development**, the designer progressively incorporates the mechanical, electrical, and technical requirements submitted by other consultants and coordinates their impact on the interior design. The designer analyzes and suggests sources for finishes, materials, and features, develops design details, and finalizes the choices with the client. Elevation and section drawings are provided along with visuals, additional plans, and drawings, and detailing.

**Working Drawings & Specifications**: this detailed documentation phase includes drawings, details, schedules, and specifications and constitutes the basis for the tendering process with Interior contractors, Fit-Out Firms, and suppliers. It usually includes reviewing all the shop drawings.

**Site Supervision** may be part of the designer's scope of work, intended as a periodic review of construction work progress on site with an assessment of their compliance with the design intention.

In terms of Furniture Design, the phases of the interior design process in practice include:

Assessment and Research Preliminary Design & Schematic Planning Conceptual Design Design Development Working Drawings & Prototyping Testing and Final Production

The relevance of sketching during the process is crucial. It is a tool for understanding proportions, shapes, forms, and details. Tridimensional visualizations support the conceptual phase, which involves sketching and elevating the project to realistic and accurate concepts for the client and general audience.

#### 2. VR and AR in Furniture Design

Cumulative evidence suggests that VR is a viable and worthwhile technology for application in the FFE sector that can drastically improve the efficiency of this sector by enhancing design communication and collaboration (Prabhakaran, Mahamadu, Mahdjoubi, Booth, & Aigbavboa, 2023).

VR technology promotes access to simulative visualizations and creates an immersive experience applicable to creative solutions and projects. It is increasingly used in design architecture and related disciplines. It supports the design process for both the designer and the client. Furniture design represents a successful example of the application of these innovative technologies. It allows easy personalization and modification. Several brands also employ interactive 3D visualizations to facilitate e-commerce. The development of VR technologies also supports improving products and furniture and identifying customer trends.

3D VR facilitates visual evaluations and creates virtual experiences by simulating realistic consumption experiences (Oh, Yoon, & Hawley, 2004).

Besides its affordability, other advantages of non-immersive desktop VR include rapid software development, efficient information sharing, collaboration through the Internet, and ease of use. The same software techniques are used for both immersive and non-immersive systems (Oh, Yoon, & Hawley, 2004).

#### 3. The Learning Experience and the Use of Innovative Technologies

Although the topic is still relatively new, several studies reflect on using VR and other mixed methods in higher education and their impact on the Learning Experience. Their introduction to the educational system generates the definition of innovative educational methods and pioneering experiences. It is still a field in evolution, and the future will bring more knowledge and outcomes. The transformation is evolving; from an academic point of view, it creates new opportunities to explore innovative methodologies, opening a new educational scene.

The educational landscape has witnessed a significant shift with the introduction of VR, which has redefined the concept of immersive learning. AR, complementing VR, overlays digital information onto the real world, enriching traditional education materials (Familoni & Onyebuchi, 2024).

In terms of emotions, usually, students demonstrate mixed feelings of excitement and intimidation. A well-structured learning experience can support their comfort. According to the study *Education in the Digital Age: Learning Experience in Virtual and Mixed Realities* on the VR impact on the learning experience, the findings suggest an emotional benefit of learning with VR use (Allcoat, Hatchard, Azmat, Stansfield, Watson, & von Mühlenen, 2021).

In summary, AR and VR have emerged as powerful tools in education, offering immersive and interactive learning experiences that can significantly enhance educational outcomes (Familoni & Onyebuchi, 2024).

#### **Purpose of the Study**

This qualitative study examines the integration of VR and AR in an undergraduate Furniture Design studio course in the Interior Design Department at the American University in Dubai (AUD) in the United Arab Emirates (UAE). The research focuses on evaluating the impact of these innovative technologies on the Learning Experience, the design process, and the definition of active learning methodologies.

The class participating in the study was composed of sixteen Junior level Interior Deign students who developed the study's project subject as an assignment of the course. After obtaining the brief and its explanation, all students approached the project and its design. The initial stages of Assessment & Research facilitated an understanding of the main theme, including issues and potential strategies. Preliminary & Schematic Design consisted of sketches, evaluation of the shape, form, and proportion with the application of standards, and the preliminary material selection and revisions. At this point, a few students decided to handle the project with VR and AR integration in their studies, aiming to complete the succeeding tasks, while others utilized traditional methods. The faculty in charge supervised the project. It included all phases, technical drawings, work progress and critical thinking demonstration, research and analysis, tridimensional visuals, and a model/prototype.

#### Method

As mentioned, the studio students developed the project following the design process phases for furniture design. In consideration that it was the first time applying these innovative technologies to the course's project, it is interesting to observe the proportion of students choosing the integrated innovative technologies and the ones deciding on typical methods:



Figure 1: Proportion Selection of VR and AR During the Design Process

The above chart highlights the commitment to test innovative technologies in a design project compared to typical methods: 25% (one quarter) of the class decided to utilize them, and 75% (three quarters) felt more comfortable with traditional methods. This is due to several reasons:

- The consideration of risk for using this not yet fully familiar method while academic assessment is applied.
- Students' concerns about tolls technical management.
- An overall sense of intimidation generated by the potential use of these still recent technologies.

As far as students were fascinated and very interested in the practice, considering that they had already been exposed to VR and AR training, they still felt uncertain about their capacity to manage these technologies for an effective outcome in the specific topic. More practice and integration in assignments and courses will lead to greater confidence, including less anxiety about their application. Again, this activity was introduced as an option for the first time on the Furniture Design topic; the same had an extremely large use in the following session.

#### **Design Process Phases**

Following the introduction of the furniture design project linked to an already developed plan and environment, the class began researching Anthropometrical Considerations and Human factors and ergonomics related to Furniture Design.

Students created a furniture Design project inspired by a famous potential client. The assignment was intended to design an innovative sitting element following the principles of anthropometry study and ergonomics.

Requirements of the exercise involved:

- To include a minimum of two varied materials.
- To include sustainable initiatives.
- To include anthropometrical considerations and ergonomics for furniture design and the built environment.
- To include innovative solutions and optional flexibility of uses as opportunities to modify the configuration.

In detail, deliverables included:

- Assessment and Research: analysis and research on the main topic with references, including documentation or graphics supporting the design and design decisions.
- **Preliminary & Schematic Design:** Initial Design progress and sketches demonstrating the progress of work and critical thinking in investigating optimal design solutions.
- **Conceptual Design:** *"THE STORY."* Design Concept Statement, reference images (Mood Board with minimum two materials), project name, and logo. Statement on sustainability and how it has been implemented in the project. Three written objectives the design should achieve (Keywords #).
- **Design Development:** Design and detailed drawings along with 3D visualization. Students decided to follow traditional methods or to integrate innovative technologies (as in the Schematic phase) for the elaboration of the project in terms of forms and space, along with proportions and ergonomics.
- Working Drawing and Model/Prototype, again with VR and AR integration options. Some students decided to print their model or prototype in 3D.
- A Final digital video expressing all the points mentioned and explaining the project.

An international Jury composed of Professionals evaluated the outcomes.

The faculty member analyzed the study through a comprehensive review of process and results, comparative assessments, observations, interviews, literature review, and a survey.

#### **Case Study – Findings & Discussion**

Case Study: students chose the client, the international artist Bansky, for the project, which is inspired-related sitting furniture. The artist has been analyzed and researched; a few reference images have been selected to compose an inspirational Mood Board: a physical or digital board expressing the project concept through colors, reference images, materials, and sketches.

After examining the most relevant aspects of the artist, his art, and its characteristics, students felt ready to translate the acknowledged concept through the design of a chair.

The main inspiration was the spray-painting technique used by the artist, which generates organic and free shapes. Students proceeded to identify design goals and sustainable initiatives included in the project. The initial material section was performed.

Design Goals:

- Flexibility of use
- Inspiration from *Graffiti Art*
- Lightness
- Sustainable

*Sustainable materials* included algae-based rigid PU foam designed with biotechnology, upcycling fabric made from PET bottles, stainless steel rods, and a lightweight extruded profile.

Free-hand sketches on paper supported the study of shape, form, and proportions. These preliminary sketches were then advanced using VR Gravity Sketch software. With dedicated equipment (headset and hand device), students could virtually "enter" the environment and virtually manipulate the design on a 1:1 scale, a real scale. This exercise made the object more visible, understandable, and easy to modify and perceive.



Figure 2: *Bankseat* Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.

The first step was to outline the actual chair where the student was sitting in real life directly in the virtual environment. This stage supported a better comprehension of standards, dimensions, and ergonomics. The outlined shape was developed directly in VR at a tridimensional level, understanding volumes, details, flexibility, and potential general and structural issues.



Figures 3 & 4: *Bankseat* – Progress of Work, Screenshots Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.



Figures 5 & 6: Bankseat – Progress of Work Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri. Images courtesy Dr. Kachaamy, Director of CRID.

According to students, the process was also enjoyable, comparable to a 'molding by hand' operation. The texture and single details were easier to explore than a typical method since it allowed the investigation and better comprehension of the overall object. The 3D objects were then translated to 2D as a consequence.

### Typical method: 2D > 3D

## VR method: 3D > 2D



Figure 7: *Bankseat* – 3D Visuals Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.



Figure 8 & 9: *Bankseat* – 3D Visuals Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.



Figure 10: *Bankseat* – 2D Drawings Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.



Figures 11 & 12: *Bankseat* – Visuals of the Furniture in the Environment Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.

The immersive experience facilitated the identification not only of benefits but also of issues or potential ones. Working on human-scale projects simplified the understanding of proportions and ergonomics. In this case, the chair could also be used as a bench seat through flexible settings (openable double-sided backseat); this flexible component has been easily explored through VR to better comprehend its characteristics and details.

In terms of adjustments, the software allows immediate modification and adjustments to proportions for real-time and real-based design visualizations. In VR, users can quickly customize the project. It also supports collaborative work.

AR was then integrated into the project, locating the object in the real environment on a real scale proportion. Finally, a model/prototype was created using the 3D printing technique.



Figures 13 & 14: *Bankseat* – AR Simulation Images Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.



Figures 15 & 16: *Bankseat* – Model images Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.

Overall, the integration of VR and AR in the design process in a Furniture Design project:

- Promotes creativity and exploration
- Supports freedom in Design
- It is enjoyable (game-related)
- Supports Active Learning
- Improves technical skills
- Supports the identification of proportions, spaces, shapes, and functions in a simulated real space
- Improves communication
- Facilitates the execution of complex shapes and forms
- Facilitates the execution of CAD drawings
- Facilitates the production of 3D visuals, including materials and their suitability
- Facilitates the production of a model or prototype: 3D printed with VR
- It is user-friendly
- The integration of AR generates a proper simulation in space

From the faculty's point of view, the method allowed easier interaction with the student, even in a "virtual world," and the advantage of simultaneously expressing and transferring critiques/concerns on the project. On the other hand, users must be trained to use these technologies, tools, and dedicated software.

The study describes the effective transformation of the Learning Experience in an immersive, interactive, and engaging Learning Environment.

Furthermore, it must be considered that rapid technological advancement requires continuous updates. The use of the software needs training and equipment supported by investments.

# Design Process





Sketches in VR, Visuals 3D>Drawings 2D > AR > Model/Prototype Figure 17: *Bankseat* – Design Process

Credits: Project by Dalin Abubaker & Mallika Takiar. Mentor Prof. A. Lambri.

Methods	Traditional	Integration of VR and AR	Notes
Phase: Assessment and Research	<ul> <li>Analysis and research on the with references, including documentation supporting the design decisions.</li> <li>Identification of client's needs.</li> </ul>	·Same.	
Phase: Preliminary & Schematic Design	<ul> <li>Initial Design Progress.</li> <li>Free-hand sketches demonstrating design intent.</li> <li>Developing critical thinking in the investigation of optimal design solutions.</li> </ul>	<ul> <li>Same.</li> <li>Free-hand sketches demonstrating design intent. Parallel use of VR or other tools to sketch in real proportions.</li> <li>Developing critical thinking in the investigation of optimal design solutions.</li> </ul>	<b>*VR:</b> Better realization proportions/ergonomics. It is like "molding" with hands. IMMERSIVE EXPERIENCE.
Phase: Conceptual Design: "THE STORY"	<ul> <li>Design Concept and Statement. Objectives.</li> <li>Mood Board composition.</li> <li>Statement on sustainability.</li> <li>Furniture Design: shape, form, ergonomics, proportions. Details and materials.</li> <li>Use of AutoCAD or similar.</li> <li>3D visualizations: 3D max, SketchUp, similar.</li> <li>Required practice on software.</li> </ul>	<ul> <li>Same.</li> <li>Mood Board may be integrated with AI.</li> <li>Same.</li> <li>VR to sketch/design in real proportions.</li> <li>VR and AI require practice.</li> </ul>	<b>*VR/AR:</b> easier adjustments and issue identification, work in real scale, better understanding ergonomics, standards, and proportions. Facilitated understanding for the client: simulation and immersive experiences generate additional engagement. Facilitating collaboration. Overall, it supports creativity. *Note: Equipment to be available; investment in equipment and training. The use requires practice.
Phase: Working Drawing	AutoCAD or similar: it requires practice on software	Same.	
Phase: Model/Prototype	Several methods for Model: manual, Laser Cutter, 3D print.	Several suitable methods: <b>3D print</b> <b>supported by VR.</b>	

# Table 1: Comparison Chart Highlighting the Similarities and Differences Between Approaches

#### Conclusions

The study emphasizes the potential of these innovative technologies and tools at the service of design. Students demonstrated to be responsive, facilitating the instructor's revision process.

In terms of methodologies, the field allows exploration to define effective and innovative active learning activities.

VR and AR promote clients' engagement thanks to a straightforward perception of the project and an increased sense of involvement. It allows a better understanding of the design and makes it easier to modify it for real personalization This aspect helps to save time in the process. Still, the human management of these technologies is extremely important.

In conclusion, utilizing VR and AR in the design process supports the design and designers. A balanced adoption of these technologies in Academia leads to pioneering teaching practices linked to the industry needs.

Much is yet to be done to investigate and examine the use of these innovative technologies in both the design and academic fields. Interestingly, the two components collaborate to benefit the overall knowledge and the profession. Many more disciplines will utilize these technologies with different approaches, opening exciting future directions in many fields.

#### **Quote From the Student:**

Regarding the final semester project, we had to get inspiration from a famous client and design a furniture piece for them. Since my client was Banksy, I wanted to create a flexible chair that was very organic and complex. I started coming up with ideas on how to apply that vision into a workable design, and I decided to make it out of one upholstered metal piece that keeps intertwining to take the shape of the chair, mimicking a spray-painting stroke.

Imagining and sketching the idea was all fun and nice until I had to model the chair; that's when I had to decide which software to use and what would make the model look as close to my vision as possible, and that's when I realized, modeling it on VR would accomplish all that. I put the headset on and started exploring all the tools I could use until I found what I needed. The process was so much fun because I could use my hands to draw the shape instead of relying on a mouse and a 2D screen. I could also model it in real-life proportions, meaning I could trace over the chair I was sitting on to get a clearer idea of the size. In addition to all that, it was easy to select any shape I made and edit all the vertices, ensuring that the lines do not intersect and that they make a flat surface that's comfortable to sit on.

After being satisfied with the model, I exported it to my computer and added it to the house I needed. It was a little bit of a challenge to figure out which file type I needed and how to modify it to show its flexibility, but through trial and error, I made it all work. This project was the start of using VR to enhance the quality of my projects and create custom shapes that I envision, which made using it for other projects easier and faster than dealing with the limitations of a 2D screen and using the 3D warehouse online. (Dalin Abubaker, AUD Interior Design student)



Figure 18: Prof. A. Lambri

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#### Computational Modeling of Morphologically Rich Languages – The Case of Nouns in Albanian Language

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#### Abstract

The Albanian language is a synthetic-analytical one. It's rich system of inflection poses significant challenges in developing computational models for morphological analysis. Our primary question is how to construct a computational morphological model specifically for the nominal system in Albanian, focusing on nouns which have various grammatical categories and forms, including number (singular and plural), gender (masculine, feminine, neutral), case (nominative, genitive, dative, accusative and ablative) and definite and indefinite forms. The initial step involves analysing the morphological structure of the nominal system of the Albanian language, identifying its grammatical categories, forms, and means of construction, such as endings, inflectional suffixes, stem alternations, suppletion, and combinations. To address this challenge, an exact methodology was employed, involving the development of formulas based on different noun stems to encompass all possible forms for each grammatical variation. These formulas were crucial for generating different forms, aiming to minimize manual intervention and streamline the automatic completion of nominal forms. The subsequent step is evaluating the developed models by comparing their results to manually constructed forms, improving the accuracy and efficiency, and validating the effectiveness of the models by testing them in real applications, such as Albanian spell checking. These models are indispensable for building applications for spelling and grammar in Albanian, as well as other NLP applications, enhancing natural language processing tools for the Albanian language.

Keywords: Albanian Language, Computational Modeling, Morphology, Nouns, Inflection, Grammatical Features



#### 1. Introduction

In today's technology-driven environments, Natural Language Processing (NLP) has become an indispensable element, serving as a cornerstone in numerous fields and applications. However, the effectiveness of NLP systems heavily significantly relies on their capability to accurately process languages with complex morphological structures. Automatic parsing of morphologically rich languages presents difficulties due to the interaction of diverse morphemes within words. Unlike languages with simpler morphological structures, such as English, morphologically rich languages develop various morphemes to express different grammatical features. This complexity presents obstacles to parsing algorithms, as they must accurately segment words into constituent morphemes and determine their grammatical roles. In recent years, Albanian Natural Language Processing has made significant strides, spurred by increasing interest in computational linguistics and the demand for tailored language technologies. Notable advancements include corpus development: National Corpus of the Albanian Language emerging as one of the most extensive resources (Arkhangelskij et al., 2012); Besim Kabashi's creation of the AlCo corpus (Kabashi, 2017); Nebi and Ali Caka's CAKA corpus (Caka & Caka, 2012); and the sqGLOBE corpus (BFSU 2008-2012) developed by Chinese researchers. Morphological and syntactic analysis have been central areas of focus, with scholars such as Trommer and Kallulli (2004), Caka and Neziri (2011), and Kabashi and Proisl (2018) developing taggers and analyzers to address challenges like morphological ambiguity. Efforts in Named Entity Recognition (NER) have been spearheaded by researchers including Skënduli and Biba (Sadiku & Biba, 2012) and Kote et al. (2019), leveraging machine learning methodologies and Conditional Random Fields (CRF) to enhance performance in this domain Additionally, sentiment analysis studies by Biba and Mane (2014) and Ajdari et al. (2017), among others, have explored emotion detection and hate speech identification in Albanian text. These endeavours underscore progress in Albanian NLP, although challenges persist, notably the scarcity of annotated data and the necessity for more extensive corpora.

Throughout the development of the "Albanian Language in the Digital Era" project, led by the Center for Educational and Promotion in Pristina (https://gjuhashqipe.com) and supported by the Ministry of Education, Science, and Innovation in Kosovo, our focus has been on constructing a computational morphological model encompassing all parts of speech and their various forms in Albanian. The focus of this paper is the model designed for the nominal system of Albanian language, which targets nouns that present a diverse range of grammatical categories and forms, covering singular and plural numbers, masculine, feminine, and neuter genders, as well as cases such as nominative, genitive, dative, accusative, and ablative, alongside definite and indefinite forms.

Albanian language belongs to the Indo-European family and is a rich morphology language, especially the verbal and noun system. Today, the Albanian language is spoken by more than seven million people in the Republic of Albania, the Republic of Kosovo, the western and northwestern parts of the Republic of North Macedonia, some municipalities in the southeastern part of the Republic of Montenegro, the municipalities of Preševo, Bujanoc, and Medvedja (Republic of Serbia), some areas of Greece (Chameria, etc.), and the old Albanian settlements of Italy, Greece, Ukraine, Bulgaria, etc., as well as in Albanian communities in various countries worldwide.

This paper provides an overview of techniques for analysing morphologically rich languages, focusing on Albanian nouns, characterized by various grammatical features, including

gender, number, case, and definiteness, each expressed through a multitude of form patterns. Developing computer models for noun morphology is essential for various natural language processing tasks, including parsing, lemmatization, spell checking, text generation, machine translation, information retrieval etc. We describe the process of creating digital models to generate and analyse Albanian noun forms, describing the complexities and challenges encountered in this process.

The first step is to analyse the morphological structure of the nominal system of the Albanian language, identifying its grammatical categories, forms, and means by which these forms are constructed. An important point in this process is data collection, which includes gathering a wide range of nouns and all their possible grammatical features and variations. All these forms are used to construct the development of computational models of nouns in Albanian, based on the collected data and devised formulas about the morphological transformations of nouns. The next step is the evaluation of the developed models, comparing their results to manually constructed forms, and improving the accuracy and efficiency, and finally, the validation of the effectiveness of the models by testing them in real applications, such as Albanian spell checker. The first version of the Albanian spell-checker took place as part of the "Gjuha shqipe dhe kompjuteri" project (1998–2004), organized by the Qendra për Edukim dhe Përparim (QEP) in collaboration with linguists and computer scientists from Albania and Kosovo (Çepani & Çerpja, 2017: 89-106).

#### 2. General Knowledge About the Nominal System of the Albanian Language

The grammatical categories of the nouns are gender, number, case, and the definiteness/indefiniteness (Agalliu et al., 2002).

#### Grammatical Category of the Gender of the Noun

The gender is an important grammatical category of the noun and every noun in the Albanian language can be in one of the three genders: masculine, feminine and neuter. Most nouns are masculine or feminine; only a small number of nouns are neuter.

Gender is an inherent feature of nouns and is syntactically independent in Albanian. The ending sounds of the stems and the case endings of the definite and indefinite forms are a morphological way, which serve to distinguish the gender of nouns together with the syntactic and lexical way.

- The masculine definite forms end in *-i* or *-u*: *emër emri* (noun); *çaj çaji* (tea); *kek keku* (cake); *zog zogu* (bird).
- The feminine definite forms end in *-a* or *-ja*: *kuzhinë kuzhina* (kitchen); *vezë veza* (egg); *shije shija* (taste); *gjyshe gjyshja* (grandmother); *domate domatja* (tomato).
- The neuter definite forms end in *-t(ë)* or *-it: të ngrënët* (eating); *të kuqtë* (redness); *të gatuarit* (cooking); *të shijuarit* (tasting).

#### Grammatical Category of Number to Noun

In the Albanian language, the noun has two numbers: *singular* and *plural*. Most nouns have special forms for both numbers: mur - mure (wall), cante - canta (bag), etc. But there are some singularia tantum nouns in Albanian, which are used only in singular forms, e.g. *sheqer* (sugar), *benzine* (gasoline); or proper nouns, such as *Albania, Saranda*, etc., while some other

nouns are used only in the plural number, such as the pluralia tantum: *pantallona* (pants), *syze* (glasses) etc.

Singular and plural of the nouns in Albanian are distinguished by:

- a. The plural suffixes or stem alternations of the noun itself: *mal male* (mountain/s), *libër libra* (book/s), *mik miq* (friend/s), *breg brigje* (cost/s).
- b. Noun modifiers that agree the noun in number: *laps i zi lapsa të zinj* (black pencil black pencils), *ai laps ata lapsa* (that pencil those pencils); *shtëpi e re shtëpi të reja* (new house new houses), *kjo shtëpi këto shtëpi (this house these houses*).

The Albanian nouns have a special stem for the plural, to which the endings of indefinite or definite plural cases are appended. The stem of singular can be the same with the stem of plural for a group of nouns:  $nx\ddot{e}n\ddot{e}s - nx\ddot{e}n\ddot{e}s$  (pupil/s),  $flet\ddot{e} - flet\ddot{e}$  (sheet/s), while for the rest of the nouns these two stems are different and the plural stem is formed from the singular one by other means.

The plural stem is formed in one of these four ways:

- 1. Without any means, ie. the stem of the plural is the same as the stem of the singular: *mësues mësues* (teacher/s), *lot lot* (tear/s), *mollë mollë* (apple/s), *nxënës nxënës* (pupil/s), *përkthyes përkthyes* (translator/s), *kafshë kafshë* (animal/s), *shtëpi shtëpi* (house/s), etc.;
- By plural suffixes: mal male (mountain/s), fshat fshatra (village/s), kumbull kumbulla (plum/s), kopsht kopshte (garden/s), drejtor drejtorë (director/s), hero heronj (hero/es), lumë lumenj (river/s), etc.;
- 3. By vowels or consonants changes: dorë duar (hand/s), plak pleq (old man/men), grua gra (woman/women), peshk peshq (fish/es), bir bij (son/s), etc.;
- 4. By plural suffixes and vowels or consonants changes at the same time: *shteg shtigje* (path/es), *rrezik rreziqe* (risk/s), *bllok blloqe* (block/s), *lëng lëngje* (liquid/s), etc.

#### Grammatical Category of Case and Definiteness / Indefiniteness Form

Nouns in the Albanian language can be used in different cases forms according to their syntactic function in the sentence. There are five cases in Albanian: nominative, genitive, dative, accusative, and ablative. Definiteness is expressed using inflectional suffixes.

The nominative case has two forms: an indefinite and a definite form. The defined form is created by adding the suitable case marker (m., f., n.) to the indefinite form.

Some of the forms are the same in different cases, i.e:

*Kjo shkollë është e re*. (nominative case) This **school** is new.

*Po lyejnë shkollën*. (accusative case) They are painting the **school**.

The genitive forms differ from the forms of the dative and ablative only by the preceding article:

*Sot është ditëlindja e shokut të klasës.* (genitive case) Today is my classmate's **birthday.** 

*Librin ia dhurova* **shokut** *të klasës*. (dative case) I gave the book to my **classmate.** 

*Këtë dhuratë e kam prej shokut të klasës*. (ablative case) I got this gift from my **classmate.** 

The formation of the five cases forms in Albanian nouns is complicated and follows different rules. These forms are used for different syntactic purposes and often require additional morphological changes to the noun stem.

The totality of all the changes that the noun undergoes when it is used in different cases is called *declination*. These changes differ according to the case, and each of them comes out in the definite and indefinite form. The nouns in the Albanian language are grouped into four declinations according to the ending of the definite nominative case of the singular form:

**Declination I** includes all masculine nouns that end in *-i* in singular, definite nominative case, e.g. *djal-i* (son), *lis-i* (oak), *burr-i* (man), *fto-i* (quince), *vëlla-i* (brother), etc.

**Declination II** includes masculine nouns that end in -u in singular, definite nominative case, e.g. *mik-u* (friend), *zog-u* (bird), *dhe-u* (earth), *ah-u* (beech), etc.

**Declination III** includes feminine nouns that end in *-a*, *-ja* in singular, definite nominative case, e.g. *vajz-a* girl, *tryez-a* (table), *fush-a* (field), *motr-a* (sister), *lul-ja* (flower), *del-ja* (sheep), etc.

**Declination IV** includes neuter nouns that end in -it,  $-t(\ddot{e})$ , in singular, definite nominative case, e.g.  $t\ddot{e}$  folurit (speaking),  $t\ddot{e}$  ftoht $\ddot{e}$ -t (the cold),  $t\ddot{e}$  ri-t $\ddot{e}$  (youth), etc.

#### 3. Modeling the Nominal System of the Albanian Language

The morphological structure of the nominal system in the Albanian language, involving various grammatical categories, forms, and means of construction, such as endings, inflectional suffixes, stem alternations, suppletion, and combinations of them, necessitates the development of computational models to generate and analyse noun forms. An exact methodology is used to construct such models, involving the development of formulas based on different noun stems to encompass all possible forms for each grammatical variation. These formulas are crucial for generating different forms, aiming to minimize manual intervention and to simplify the automatic completion of nominal forms.

Gender	Declination	Plural	Suffixes and types of sound	Examples
			en ange	nränäs (pupil)
		os singular	as singular (Ë)	callmähardhä (white turbon)
		as singular	Abbreviation (i)	<i>çulimebarane</i> (winte turbali)
				adim (error) rrath (circle)
			e_Ë	<i>cikäl</i> (cycle)
			<u> </u>	lihör
			-9	hel (spade) plen (poplar)
			u	anëtar (member), luftëtar
			-ë	(fighter)
			-nj	hu (stake), kalli (cob)
		with suffixes	-inj	drapër (hook)
			-inj	shkëmb (rock)
			-j + N extension	kalama (kiddy)
			-j + R extension	<i>kufi</i> (limit)
			-enj	<i>lumë</i> (river)
			-ër	<i>mbret</i> (king)
	-		-ra	bar I (grass)
	1		-na	<i>bar II</i> (drug)
			palatalization ll>j	akull (ice), avull (steam)
			palatalization r>j	<i>bir</i> (son), <i>lepur</i> (rabbit)
		with sound	palatalization ll> j and first	mashkull (male)
		changes	vowel change	
			palatalization II>j and second	bakall (grocer)
		with sound	vowel change $u_{2>0} + -NI$	ftua (quince)
masculine		changes and	nalatalization ll>i vowel	<i>huall</i> (honeycomb) <i>truall</i>
		suffixes	change + -E	(land)
			a>e	cjap (goat)
			e>a	Thes (sack), rreth (circle)
		other sound	i>e	<i>vit-vjet</i> (year)
		changes	vowel change ë>u + -Ë	dhëndër (bridegroom)
			palatalization g>gj + -E	gardh (fence)
		with one hig	with a partially same or	<i>djalë – djem</i> (boy),
		difference	different composition	<i>kalë - kuaj</i> (horse)
			MANUAL	
			acronim (u)	KEK (KEK)
		with suffixes	e	<i>lek</i> (lek), <i>lbrik</i> (kettle)
				<i>debtol</i>
		with sound	-ia nalatalization (k>a)	mik (friend)
			palatalization (x < q)	zog (bird)
П	enunges	palatalization $k \ge q$ , vowel	<i>bllok</i> (block)	
		change $a > e + -E$		
	with sound	palatalization g>gj) +-E	<i>lëng</i> (liquid)	
		changes and suffixes	palatalization g>gj, vowel	breg (shore)
			change e>i + −E	
			palatalization k>q, vowel	<i>lak</i> (loop)
		•	change a>e + -E	1 / `
		with	with a static llas and a	<i>ka - qe</i> (cow)
		suppletive	different composition manual	
			an element composition manual as singular $\Delta$	këngë (song)
feminine	ш	as singular	as singular -A	nxënëse (schoolgirl)
		Singului	as singular -JE	<i>mbledhje</i> (meeting)

|--|

			as singular -IE	borxhlie (indebted)	
			as singular -E	vegane (vegan)	
			as singular accented (i)	shtëpi (house)	
			as singular accented (a, e)	sevda (love)	
			as singular -ja (o)	depo (storehouse)	
			acronym (definite)	UEFA (UEFA)	
			acronym (-së)	ATSH (ATSH)	
			acronym (-s)	NATO (NATO)	
				fushë (field), verë II	
			-a	(summer)	
		-a (ël)	<i>vegël</i> (tool)		
		-a (ull)	<i>kumbull</i> (plum)		
		with suffixes	-a article -ë	<i>e drejtë</i> (right)	
			-a nyjë	<i>e çelur</i> (blown)	
			-ra	verë I (wine)	
			composite f. with fem. noun	dhëmbësharrë (tooth saw)	
			composite mwith fem. noun	dhëmbësharrë (tooth saw)	
			with a partially same or	<i>grua - gra</i> (woman)	
		difference	different composition		
		without	nominal participle -IT	të folurit (speaking)	
neuter	IV	amount	nominal participle -ËT	të qarët (crying)	
		amount	nominal neutral adjective	<i>të nxehtët</i> (hot)	

#### 3.1. Data Collection

The first step in modelling the nominal system of the Albanian language starts by collecting a comprehensive dataset of nouns and their corresponding forms, including variations in gender, number, case, and definiteness / indefiniteness. This dataset serves as the foundation for developing computational models and ensuring their accuracy and coverage across different linguistic contexts.

#### 3.2. Formula Development

A rule-based approach was employed to address the complex nature of noun inflection while developing digital morphological models for Albanian nouns. This methodology included a systematic analysis of the patterns of Albanian noun paradigm, followed by the formulation of rules to generate all possible forms of a noun. As we mentioned above, nouns in the Albanian language have several grammatical categories, each characterized by a number of forms. Every noun has different forms according to the gender, number, case and the definite or indefinite form. Each of these grammatical categories affects the inflectional patterns associated with the noun.

Formulas are developed from the collected data to systematically generate noun forms. These formulas are valid for all morphological transformations of nouns, considering the variations in gender, number, case, and definiteness / indefiniteness. By implementing these formulas within computational models, it becomes possible to automate the generation of most noun forms without manual intervention, thereby enhancing efficiency and scalability.

According to the data table above and comparing the nominal and verbal system in Albanian, it's clear that, although the noun has fewer grammatical categories than the verb, it has many patterns even within the same grammatical category.

The challenge of designing this algorithm for nouns is the generation of all noun forms in the Albanian language, which begins with the selection of the declination, and one of the respective patterns of the nouns for each declination. There are three stems about each noun (see Table 2: *nxënës* - pupil), on which the generation of all forms of this noun and the corresponding explanations are performed. The formulas for generating these nouns are used for all other nouns that are included in the same group as "nxënës", which have the same forms as for the singular and for the plural, for example *mësues* (teacher), *shitës* (seller), etc.

Tuble 2: Busic Stellis for the roun managements (pupil)					
The masculine noun NXËNËS ( <i>pupil</i> )					
The formula	Grammatical features	Stems			
<b>E</b> 1	nominative, singular, indefinite	nxënës			
E2=E1	nominative, singular, definite	nxënës			
E3=E1	nominative, plural, indefinite	nxënës			

 Table 2: Basic Stems for the Noun NXËNËS (pupil)

This algorithm is very important, considering that the formulas of the noun *nxënës* serve as an exact pattern to automatically generate all nominal forms for 10.477 nouns in Albanian.

Several steps must be followed for the operation of this algorithm, which are related to the different stems of the noun. First, the user must choose the type of noun considering the declination and the changes it undergoes in the plural number. This helps the algorithm to automatically complete the three stems:

- 1. E1 the singular stem of the nominative case, singular, indefinite form, is automatically filled in, it's the representative form of the nouns in Albanian.
- 2. E2 the stem of the nominative case, singular, definite form changes in some nouns and does not change in others. It does not change in the case of noun *nxënës* (pupil) E2 = E1.
- 3. E3 the stem of the nominative case, plural, indefinite form, differs in a considerable number of nouns. This stem is also used for all definite forms in the plural, and it is E3 = E1 in the case of noun *nxënës* (pupil).

Indefinite, singular			Definite, singular	
nominative	një	nxënës	nominative	nxënësi
genitive (i)	një	nxënësi	genitive (i)	nxënësit
dative	një	nxënësi	dative	nxënësit
accusative	një	nxënës	accusative	nxënësin
ablative (prej)	një	nxënësi	ablative (prej)	nxënësit
Indefinite, plural		Definitive, plural		
nominative	ca	nxënës	nominative	nxënësit
genitive (i)	ca	nxënësve	genitive (i)	nxënësve
dative	ca	nxënësve	dative	nxënësve
accusative	ca	nxënës	accusative	nxënësit
ablative (prej)	ca	nxënësish	ablativa (mai )	
	ca	nxënësve	abiative (prej)	nxenesve

Table 3: The Full Forms of Masculine Noun NXËNËS (pupil)

Indefinite, singular		Definite, singular		
nominative	një	<i>E1</i>	nominative E1+	
genitive (i)	një	E1+i	genitive (i)	E1+it
dative	një	E1+i	dative	E1+it
accusative	një	<i>E1</i>	accusative	E1+in
ablative (prej)	një	E1+i	ablative (prej) E1+	
Indefinite	Indefinite, plural		Definite, plural	
nominative	ca	<i>E1</i>	nominative	E1+it
genitive (i)	ca	E1+ve	genitive (i)	E1+ve
dative	ca	E1+ve	dative	E1+ve
accusative	ca	<i>E1</i>	accusative	E1+it
ablativo (proj.)	ca	E1+ish	ablativa (proj.)	$E1 \pm va$
ablative (prej)	ca	E1+ve	ablative (prej)	$L_1 + Ve$

Table 4: The Forms With Formula of Masculine Noun NXËNËS (pupil)

Starting from the way different nouns construct the form of the nominative case, the singular, as well as the form of the plural, including the difference in gender, we have compiled 65 representative models of formulas for the automatic generation of different nouns forms in the Albanian language, which are illustrated below with the nouns representing the four declination in Albanian: TRUALL (land), ZOG (bird), KËNGË (song), and TË QARËT (crying).

Table 5: The Masculine Noun TRUALL (land) – 1st Declination

The formula	Grammatical features	Stems
E1	nominative, singular, indefinite	truall
E2=E1	nominative, singular, definite	truall
E3=E1+e (ua>o, ll >j)	nominative, plural, indefinite	troje

Table 6: The	Masculine	Noun ZOG	(bird)	- 2nd Dec	lination
1		1.00011 - 0 0	(~~~)		

The formula	Grammatical features	Stems
E1	nominative, singular, indefinite	zog
E2=E1	nominative, singular, definite	zog
E3=E1 (g>gj)	nominative, plural, indefinite	zogj

Table 7: The Feminine Noun KËNGË (song) – 3rd Declination

The formula	Grammatical features	Stems
<b>E1</b>	nominative, singular, indefinite	këngë
E2=E1-ë	nominative, singular, DEFINITE	këng
E3=E1	nominative, plural, indefinite	këngë

Table 8: The Neuter Noun TË QARËT (crying) – 4th Declination

The		
formula	Grammatical features	Stems
<b>E1</b>	nominative, singular, indefinite	qarë
E2=E1	nominative, singular, definite	qarë
E3=E1-ë	nominative, plural, indefinite	qar

#### 3.3. Model Evaluation

These developed computational models have undergone to a rigorous evaluation to assess their accuracy and effectiveness in generating noun forms. This evaluation involved comparing the output of the models against manually constructed forms, identifying any inconsistency or errors, and refining the models accordingly. By continuous improving the models based on evaluation results, their overall performance and reliability could be enhanced.

#### 3.4. Application Testing

Once validated through evaluation process, the computational models were tested in realworld applications to demonstrate their utility and effectiveness. This testing phase involved integrating the models into NLP tools for Albanian language processing, such as spell checkers, grammatical analysers. These applications served as e very good and important way of enhancing the quality during the evaluating process about the performance of these models (Çerpja & Çepani, 2022).

#### 4. Challenges in Computer Modeling

The challenge in the computer modelling of nouns in the Albanian language is related to the correct completion of their different forms, considering the interaction of the grammatical categories of nouns. Determining the appropriate inflectional forms for each noun means choosing them according to the gender and number.

In building algorithms for noun morphology, it is essential considering the different inflectional patterns associated with masculine, feminine, and neuter nouns, as well as the irregularities and exceptions within them. The presence of irregular nouns and exceptions complicates the modelling process. Irregular nouns may deviate from standard inflection patterns, requiring special attention within computer models.

Likewise, exceptions to standard inflection rules introduce inaccuracies during automatic generation, so they require attention in modelling formulas to ensure accurate generation of noun forms, but the number of 'irregular' nouns in Albanian language is very low compared to all the nouns.

#### 5. Conclusions

Modelling the nominal system of the Albanian language presents significant challenges due to its rich morphological structure and diverse grammatical categories. However, by applying rigorous methodologies for data collection, formula development, model evaluation, and application testing, there are constructed computational models capable of generating and analysing noun forms accurately and efficiently. These models are essential for various NLP tasks in Albanian language processing, facilitating the development of advanced linguistic tools and applications.

The digital morphological structure has served as the basis for the construction of Albanian spelling and grammar, as an integral component of the "Albanian Language in the Digital Era" project. This integration has highlighted the accuracy of the generation of nouns forms.

The effectiveness of these models can be further enhanced through continued research and refinement, particularly in handling irregular cases and dialectal variations, contributing to the advancement of NLP technologies for morphologically rich languages like Albanian.

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### The Dynamics of National Identity Among Students in the Entikong Border Region: Decolonization, Rationality, and Kinship Ties

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#### Abstract

Identity issues are a prominent topic in the Indonesia-Malaysia border region, particularly amidst the dynamics of transnationalism. Students in Entikong, specifically in Sontas Village, Indonesia, face challenges in forming their national citizenship identity, influenced by decolonization and rationality in choosing citizenship. Family ties and ancestral lands are key factors driving their decisions. This study employs a qualitative ethnographic approach and has been conducted over a span of more than five years. Initial findings reveal that transnationalism significantly shapes how students identify and construct their national identity. Civic Education teachers play a crucial role in this process, assisting students in understanding and navigating the complexities of national identity amidst cross-border cultural influences. The study demonstrates that the formation of national citizenship identity is shaped by rational considerations, family ties, and the legacies of decolonization. Through in-depth interviews and participatory observations, this research provides a comprehensive understanding of how students in border regions confront challenges and leverage opportunities in defining their national identity and nationalism. The findings of this research are expected to contribute to a deeper understanding of the dynamics of identity in border areas and the pivotal role of civic education in the context of transnationalism.

Keywords: Border Dynamics, Civic Education, Decolonization, National Identity, Transnationalism

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#### Introduction

This paper discusses critical issues related to the formation of citizenship identity in the Indonesia-Malaysia border area, particularly in Sontas Village, Entikong. In the context of strong transnationalism in this border region, students face complex challenges in shaping their identity, influenced by the history of decolonization and rational considerations in choosing citizenship. The Entikong border area, especially Sontas Village, represents a unique setting in the dynamics of national identity due to its direct border with Malaysia. In this situation, students in the border area are influenced not only by Indonesian local culture and values but also by cross-border cultural interactions with Malaysia (Dewantara & Budimansyah, 2024). This phenomenon presents challenges in forming a national identity, where the influence of transnational culture and colonial history shapes how students perceive their citizenship and nationalism (Dewantara et al., 2023).

The decolonization process that has occurred in both countries adds complexity to the formation of national identity. Many students in this region have familial ties with residents of both countries, making their decisions regarding citizenship and national allegiance often influenced by considerations of blood relations and family connections. This creates an identity dilemma for students, who must decide whether they feel more attached to Indonesian identity, Malaysian identity, or a combination of both. Beyond familial ties, rationality in choosing citizenship is also an essential aspect. This choice is often based on pragmatic benefits, such as access to education, economic opportunities, and better social prospects in one country (Efriani et al., 2020). However, in this process, students frequently face uncertainty in maintaining a solid national identity, especially as this identity is continuously influenced by intense crossborder interactions.

Civic Education teachers play a crucial role in helping students understand the complexities of national identity amid transnationalism (Martono et al., 2021). Formal education serves as an essential medium for instilling citizenship values and nationalism. However, the strong influence of cross-border culture and families demands a more sensitive and contextual approach in teaching (Sulistyarini et al., 2021). Therefore, this research is crucial to explore how the dynamics of students' national identity in the Entikong border area are shaped by decolonization, rationality, and familial ties. Understanding these factors is expected to uncover more effective ways to support the development of a strong national identity in border areas through civic education.

This study aims to analyze the influence of decolonization on the formation of students' national identity in the Entikong border region, particularly in the context of the colonial history between Indonesia and Malaysia. Additionally, it seeks to identify the role of rationality in students' decision-making regarding their citizenship identity and how they choose citizenship based on practical considerations. The study also aims to uncover the role of familial ties and attachment to ancestral lands in shaping students' national identity, as well as its impact on their citizenship loyalty. Furthermore, this research explores the role of Civic Education teachers in assisting students in understanding and shaping their national identity amid the influence of transnationalism and cross-border culture. Finally, this study provides recommendations for the development of more contextualized civic education curricula and teaching approaches, particularly in border areas facing transnational challenges.

### Method

This study employs a multisite ethnographic method, a qualitative approach that allows researchers to examine the complex social, cultural, and identity dynamics across multiple interconnected locations (Blasco & Wardle, 2007). In the context of this research, multisite ethnography is used to explore the formation of students' national identity in the Entikong border region, influenced by transnationalism and cross-border interactions between Indonesia and Malaysia. This approach is well-suited for uncovering phenomena involving multiple cultural and geographical contexts, particularly when the process of identity formation occurs in various yet interconnected social sites.

Multisite ethnography enables researchers to examine different locations, such as schools, homes, and other social spaces on both sides of the border. The researcher interacts with students, teachers, parents, and local community members to understand how the formation of national identity is shaped by factors such as familial ties, decolonization, and rationality in choosing citizenship. Through this approach, the researcher can map broader social and cultural networks and observe how identity dynamics in one site relate to those in another.

Data collection is conducted through in-depth interviews, participant observation, and documentation of daily life on both sides of the border. Interviews are carried out with students as the primary subjects of the study, as well as with Civic Education teachers, parents, and local community members to gain diverse perspectives. Participant observation is conducted in school environments and community settings to observe how national identity is manifested in everyday interactions, educational activities, and social life.

Additionally, data analysis is performed thematically, comparing and analyzing data from various sites to identify patterns, similarities, and differences in the formation of students' national identity. By using a multisite ethnographic approach, this study can reveal the crossborder dynamics that influence students in formulating their identity and how they navigate the challenges of understanding citizenship and nationalism in the border region. This method provides flexibility in examining complex and dynamic social phenomena, allowing researchers to capture the nuances of cross-border interactions and the influence of transnational culture on the formation of students' national identity.

# **Result and Disscusion**

This study reveals that the formation of national identity among students in the Entikong border area, specifically in Sontas Village, is strongly influenced by three main factors: decolonization, rationality in citizenship selection, and kinship ties. These findings were obtained through participatory observation, in-depth interviews, and data analysis from various sites in the border area, including schools, homes, and communities.

# The Influence of Decolonization

The process of decolonization that occurred between Indonesia and Malaysia continues to impact the formation of students' national identity. In interviews with teachers and students, it was found that many historical narratives in schools, particularly in Citizenship Education lessons, emphasize the importance of post-colonial national identity. However, students often feel caught between the national history of Indonesia and the cultural influences from Malaysia, considering the historical relationship between the two countries. This is further exacerbated by easy access to Malaysian media and culture, exposing them to transnational values and identities (Martono et al., 2022).

The decolonization process between Indonesia and Malaysia in the mid-20th century has had a significant impact on the formation of national identity, particularly for communities living in border areas between the two countries. In an educational context, the influence of this historical process is still felt today, especially in the formation of students' identities. In border areas like Entikong, the historical narratives and values taught in schools often conflict with the social and cultural realities that students experience daily. The decolonization that separated Indonesia and Malaysia into two sovereign states created a boundary that is not only geographic but also political and cultural. National history narratives in Indonesia often emphasize the struggle to maintain national identity post-colonial, an identity defined by national values, a spirit of unity, and loyalty to the state. In schools, particularly in Citizenship Education lessons, this narrative forms the core of students' national awareness. Teachers instill nationalistic values by emphasizing the importance of Indonesia's struggle for independence and the building of a sovereign state. However, interviews with teachers and students in border areas reveal the complexity of national identity formation among students. Students in Entikong, for example, are not only influenced by the national history narrative taught in schools but also by the reality of their lives near the border with Malaysia. The historical relationship between Indonesia and Malaysia, which includes a shared cultural heritage and cross-border interactions, creates a unique dynamic in the identity formation process (Barnsley & Bleiker, 2008).

One of the main challenges students face is navigating between their national identity as Indonesians and the cultural influences from Malaysia. On the one hand, students are taught to take pride in their national identity as Indonesian citizens, built through the struggle against colonialism. On the other hand, they live in an environment exposed to Malaysian culture and values, both through direct interactions with communities across the border and through media. Easy access to Malaysian television channels, music, food, and daily lifestyles makes students familiar with elements of Malaysian culture, which are often considered more modern or appealing. These cross-border interactions create a situation where students feel torn between two identities. For some students, their national identity as Indonesians becomes something abstract and distant from their everyday reality, especially when they often use the Malay language, which resembles the Malaysian dialect, in daily life. When asked about how they perceive their identity, many students acknowledge that they feel a cultural closeness to Malaysia while still maintaining loyalty to Indonesia. This situation illustrates the development of a transnational identity in the border area, which is not entirely bound by national boundaries but also not completely detached from national identity influences.

Citizenship Education teachers in the border area are aware of this challenge. They recognize that students face a dilemma in understanding and accepting their national identity, given the different realities of their lives compared to the national narratives taught in schools (Dewantara et al., 2023). To address this, teachers try to connect lessons about national identity with students' daily experiences. For example, they illustrate the importance of nationalistic values in a local context, such as maintaining cultural diversity at the border or building good relationships with people across the border without losing their sense of nationalism. However, this approach is often insufficient to counter the influence of Malaysian transnational media and culture. Students are more exposed to Malaysian popular culture through television channels and the internet, which offer entertainment and information that are often more engaging than the formal educational materials in schools. This influence not only shapes their

preferences for music, films, and fashion but also affects how they perceive their own identity. Many students admit they feel more comfortable using Malaysian Malay terms in daily communication, which often differ from the formal Indonesian language taught in schools.

Additionally, cross-border kinship relations further reinforce this transnational identity dynamic. Many students have relatives in Malaysia, whom they often visit or who visit them. These relationships create a sense of emotional and cultural closeness that is hard to ignore. In interviews, some students even expressed that they feel more accepted or valued when interacting with relatives in Malaysia compared to their experiences in school environments. This fact highlights the need for a more innovative approach to education in border areas. Teachers and policymakers need to consider the transnational realities faced by students as an integral part of their identity formation. Instead of emphasizing national identity exclusively, education should accommodate these transnational dynamics in a constructive manner. For instance, the curriculum could be designed to teach students about the importance of national identity while also appreciating the transnational values they experience. In this way, students can understand their identity as part of a global community without losing their sense of nationalism.

Ultimately, the formation of national identity among students in border areas like Entikong reflects the challenges and opportunities presented by globalization and decolonization. National identity is no longer something static or absolute, but dynamic and contextual, influenced by interactions between history, culture, and social realities. With an inclusive and contextual educational approach, students can be helped to navigate this complexity, enabling them to appreciate their identity as Indonesian citizens while understanding their role in an increasingly connected world.

# **Rationality in Choosing Citizenship**

Rationality plays a significant role in the formation of national identity. In choosing citizenship, many students consider economic and social factors. Students from families with relatives in Malaysia are more likely to contemplate changing their citizenship or seeking benefits from both sides of the border, such as access to better education or employment opportunities in Malaysia. This study finds that, despite being legally Indonesian citizens, many identify as "border residents" who utilize both countries for practical advantages. This suggests that national identity in this region is not static but dynamic and influenced by economic rationality.

The Indonesia-Malaysia border region has long been a place where national identity meets, clashes, and transforms. In this context, rationality plays a significant role in the formation of national identity. The choice to retain citizenship or even consider changing citizenship is often based not only on emotional aspects or patriotism but also on rational considerations related to economic and social factors. This phenomenon is particularly evident among students living in border areas, where access to facilities and opportunities in both countries is part of their daily life. Many students in border areas have relatives living in Malaysia. The geographical proximity and kinship ties create a unique dynamic in the formation of their identities. For example, extended families are often spread across both sides of the border, with some family members holding Indonesian citizenship and others Malaysian citizenship. This creates an environment where national borders are not perceived as strict barriers but rather as flexible administrative markers. In interviews with students and their families, it was found that many exploit this situation for practical advantages. For instance, a student may live and study in Indonesia but frequently visit Malaysia for better healthcare or to attend family events.

Conversely, some students with relatives in Malaysia use these connections to seek better job or educational opportunities in the country. This cross-border interaction pattern shows that their national identity is not solely shaped by formal citizenship but also by daily life experiences in an interconnected region (Dewantara & Budimansyah, 2024).

Economic rationality becomes one of the key factors in the formation of identity in the border region. The better economic opportunities in Malaysia often present an irresistible attraction. With higher minimum wages and more job opportunities, many families in the border region view Malaysia as a place that offers a better life. In this context, students are often raised with the understanding that their success may depend on their ability to take advantage of both sides of the border. Similarly, access to education becomes an important factor. The education system in Malaysia, considered more advanced by some families, is an attractive feature. Some students from Indonesia regularly cross the border to study in Malaysia, while others attend community-based education programs in the border region that integrate curricula from both countries. This cross-border educational experience shapes their views on national identity, where they see themselves not entirely as citizens of Indonesia or Malaysia but as individuals leveraging both for personal and family goals.

One interesting finding of this study is the emergence of the concept of identity as "border residents." Although legally Indonesian citizens, many students and families in the border region identify more as part of a cross-border community. This identity is based on their lived reality, where they routinely interact with the social, economic, and cultural systems of both countries. For example, a student may have friends on both sides of the border, speak the local languages used in both countries, and celebrate traditions influenced by both Indonesian and Malaysian cultures.

This "border resident" identity is not only practical but also reflects broader social dynamics. They do not view national boundaries as rigid dividing lines but rather as spaces that allow them to explore and take advantage of opportunities in both countries. In this context, national identity becomes more dynamic and complex, reflecting the interaction of legal, social, and economic factors. Rationality in choosing citizenship or considering opportunities in both countries has a significant impact on the national identity of students in the border region. In interviews, some students expressed that they felt more comfortable with their transnational identity, where they were not fully bound to one country. They saw themselves as individuals at the intersection of two cultures and systems, enabling them to capitalize on the best of both worlds. However, this rationality also presents challenges. Some students struggle to fully identify with one particular country or culture. They face pressure from their communities, schools, and families to "choose a side," whether it be Indonesia or Malaysia. This creates internal conflict and sometimes leads to feelings of alienation. Although they are legally Indonesian citizens, they often feel that their national identity is more fluid and complex than what is understood by formal systems.

This study shows that national identity in the Indonesia-Malaysia border region is not static, but dynamic and influenced by various factors, including economic and social rationality. Students' choices to capitalize on opportunities in both countries reflect their need to survive and thrive in this unique environment. Their identity as "border residents" shows that national borders are not obstacles but spaces that allow for interaction and opportunities. In this context, it is important for governments and educational institutions to understand these dynamics and create policies that support students in the border regions. By recognizing the complexity of their national identities, we can help them feel more accepted and supported on their journey

toward a better future. Ultimately, this dynamic national identity reflects human adaptability to an ever-changing environment and underscores the importance of a deeper understanding of life in border areas.

#### Kinship Bonds and Ancestral Land

Students in border areas often have extended families spread across both sides of the border. These kinship ties significantly influence how they formulate their national identity. Students often identify themselves not only based on the country in which they reside but also through family networks that cross national boundaries. These bonds create a sense of identity that is not exclusively tied to Indonesia or Malaysia but to a larger familial community. This research also found that ancestral land and emotional connections to the Dayak and Malay cultures play an essential role in maintaining their local ties amidst the influences of globalization and transnationalism (Sulistyarini et al., 2021).

Kinship bonds and emotional ties to ancestral lands play a crucial role in shaping students' identities in the border areas between Indonesia and Malaysia. This region is not just a physical space but also a dynamic social and cultural space, where national identity is often negotiated through family networks and cultural values that transcend national borders. Students living in border areas often face a complex identity dilemma, where they must balance loyalty to their country of residence with emotional attachment to their extended families spread across both sides of the border. This phenomenon becomes increasingly important in the context of globalization and transnationalism. Extended families in border areas are often spread across both sides of the border, creating social networks that surpass traditional national identities. For students, these relationships serve as a critical foundation for shaping their identity. For example, in interviews with students in the Kalimantan border area, many reported having close relatives living in Sarawak, Malaysia. These relationships are not only social but also economic, with family members frequently supporting each other in areas such as employment, education, and daily needs.

These kinship relationships create a more flexible and dynamic identity. Many students identify themselves not only as Indonesian citizens but also as part of a "family community" that transcends national boundaries. For example, a student may enthusiastically celebrate Indonesia's Independence Day at school, yet at the same time feel emotionally connected to Malaysian culture due to having relatives living there. This phenomenon shows that national identity is not always exclusive but can be multiple and overlapping. Besides kinship networks, emotional connections to ancestral lands become an essential aspect of shaping students' identities in border areas. Ancestral land, often associated with Dayak and Malay cultures, provides students with a strong sense of attachment to their local communities. Dayak culture, for instance, has a value system and traditions that highly respect nature and ancestral lands as an integral part of their identity. Students growing up in this environment often take pride in their cultural heritage, even as they are exposed to Malaysian culture through media and social interactions (Ma, 2011).

In this study, it was found that ancestral land functions not only as a symbol of cultural identity but also as a reminder of the historical roots and traditions that shape their lives. A student living in the Kalimantan border area, for example, expressed that although they have relatives in Malaysia and often visit them, they still feel that the ancestral land in Indonesia is their "true home." This feeling is reinforced by cultural practices such as traditional rituals, religious ceremonies, and the use of local languages that continue to be preserved in their communities. However, this local identity is not free from the challenges posed by globalization and transnationalism. Increasing access to media, technology, and cross-border mobility has made students in border areas more exposed to different values and cultures. Malaysian films, music, and television programs, for example, are often a part of students' everyday lives, creating a sense of connection with the culture of the neighboring country. In some cases, this can lead to internal conflicts, where students feel torn between their local identity as part of the Dayak or Malay communities and their transnational identity influenced by Malaysian culture. Globalization also presents challenges in preserving local traditions. Many students in border areas are beginning to feel that their cultural identity is less relevant in the context of an increasingly interconnected modern world. For example, one student expressed that while they value the Dayak traditions passed down by their family, they feel more connected to popular culture that they consume through Malaysian media. This reflects how globalization can weaken emotional ties to ancestral land and local traditions, especially among the younger generation.

In this context, students in border areas often have to negotiate complex identities. They interact not only with local and national cultures but also with transnational cultures that transcend national boundaries. This process often involves compromises, where students select elements of identity they find relevant or beneficial for their lives. For example, a student might choose to preserve Dayak traditional customs within the family but simultaneously adopt modern values influenced by Malaysian culture in their school or social life. This process reflects the dynamics of flexible and adaptive identities, where students can navigate various cultural influences without entirely abandoning their roots.

Kinship bonds and ancestral land play a critical role in shaping students' identities in the border areas between Indonesia and Malaysia. Kinship relationships that transcend national borders create a more inclusive and dynamic identity, while emotional connections to ancestral land help students maintain their ties to their local culture (Fakih, 2017; Von Lampe, 2011). However, globalization and transnationalism present new challenges, where local identity must be negotiated amidst global cultural influences. This research shows that national identity in border areas is not static but continues to evolve through the interaction of local, national, and transnational factors. In this context, it is essential for the government and local communities to support students in preserving their cultural identity while providing space for them to adapt to an increasingly interconnected world. With an inclusive and sustainable approach, students' identities in border areas can reflect the diversity and richness of cultures that cross national boundaries.

# The Role of Civic Education Teachers

Civic Education (PKn) teachers play a central role in guiding students to understand and internalize national identity. In border areas, this task becomes increasingly complex because students are often influenced by a transnational environment rich in cultural, value, and practice influences from neighboring countries, especially Malaysia. PKn teachers are expected not only to teach normative concepts of nationalism but also to accommodate the social realities of students living in a cross-border context. One of the main challenges faced by PKn teachers is the difference in national identity experiences between students living in border areas and those living in other regions. Many students have extended families spread across both sides of the border, making them feel emotionally close to the culture, traditions, and values of Malaysia. In some cases, this influence is further reinforced by easy access to media, education, and job opportunities in the neighboring country. This creates a more fluid identity, where

students do not feel fully bound to any particular country (Dewantara et al., 2020; Dewantara et al., 2023).

In this situation, conventional approaches that emphasize nationalism often prove less effective. Teachers who only teach the material textually without connecting it to students' reallife experiences risk losing relevance. This research found that students who felt that PKn teachings were not relevant to their lives tended to disregard the messages conveyed, even considering them as normative but far removed from their everyday reality. However, some teachers in these areas have tried to apply a more contextual and dialogic approach to bridge this gap. They acknowledge the cross-border reality faced by students and integrate it into their teaching methods. For example, teachers not only teach the formal definition of nationalism but also discuss how national identity can remain relevant in the context of globalization and cross-border interactions. Teachers also encourage students to share personal experiences related to life in the border area, such as their relationships with family in Malaysia or the cross-border cultural influences they experience.

This dialogic approach not only enriches learning but also provides space for students to reflect on their own identities. Teachers who use this method are more successful in instilling nationalism values because students feel that their experiences are recognized and valued. Furthermore, teachers strive to demonstrate that national identity does not have to be in conflict with cross-border realities. They teach that students can remain proud as Indonesian citizens while respecting and utilizing their cross-border relationships. Teachers also present learning materials that are relevant to the local context, such as the history of the Indonesia-Malaysia border, local cultural contributions to national identity, and the role of border areas in strengthening bilateral relations. This helps students understand the importance of their region on the national map, thereby fostering a stronger connection to national identity.

Although this approach has shown positive results, teachers still face various challenges. One of the challenges is the limited curriculum, which is often not flexible enough to adjust the material to local needs. Additionally, not all teachers have adequate training to apply this dialogic approach. Support from the government, both in the form of training and curriculum revisions, is essential to strengthen the effectiveness of PKn teaching in border areas. Overall, the role of PKn teachers in border areas is not limited to delivering lessons but also includes guiding students in formulating their national identity. Through contextual and dialogic approaches, teachers can help students integrate nationalism values with the cross-border realities they face. This step is important to ensure that students maintain a sense of pride and attachment to Indonesia, even while living in an environment saturated with transnational influences.

# Conclusions

This study shows that the formation of national identity among students in the Entikong border area is a complex and dynamic process, influenced by various factors. Decolonization, rationality, and kinship ties play significant roles in how students perceive their citizenship and identity. These factors shape students' understanding of their national belonging, not merely in terms of state borders but also through familial and cultural connections that transcend those borders. Additionally, despite the importance of Civic Education teachers in guiding students to understand and internalize national identity, the transnational challenges in border regions demand a more flexible and contextual educational approach. Students in these areas often navigate multiple influences from both Indonesia and Malaysia, creating a fluid and sometimes conflicting sense of identity. Therefore, educational strategies must consider these diverse, cross-border influences to ensure that students can develop a sense of national pride while also understanding and appreciating their broader, transnational context. With these findings, this research is expected to provide insights for the development of more effective educational strategies that can support the formation of national identity in border areas, fostering a more inclusive and adaptable understanding of citizenship in a globalized world.

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### Influences on Critical Thinking Skills Among Indonesian Secondary Students: An Empirical Analysis

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#### Abstract

This study examines the factors influencing the development of critical thinking skills among Indonesian secondary students, with a focus on teaching methods, school leadership, and socio-economic factors. Despite the introduction of student-centred learning in the 2013 curriculum, traditional rote learning continues due to insufficient teacher training and inconsistent implementation. The research identifies several key influences on critical thinking, including preschool attendance, project-based learning, parental education, school type, and school management practices. A cross-sectional survey was conducted among 1,020 students from 74 schools in the Bandung Raya region, using structured questionnaires to assess critical thinking through academic and non-academic activities. The study finds that preschool attendance and project-based learning are the most significant predictors of critical thinking skills. It also highlights that student from higher-income families, those with educated parents, and those attending schools with participative management practices tend to perform better. The findings suggest that improving early education, teaching approaches, and school environments is crucial for enhancing critical thinking in Indonesia.

Keywords: Critical Thinking Development, Indonesian Secondary Education, Project-Based Learning

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### Introduction

Indonesia's education system faces significant challenges, particularly in fostering critical thinking skills. A major issue is the dominance of rote learning, where students are treated as passive recipients rather than active creators of knowledge (Attard, 2010). This limits their ability to develop critical thinking, which is essential for problem-solving, creativity, and lifelong learning. Teacher-centred instruction, where students are expected to memorize rather than engage with the material, remains common in Indonesian classrooms (Suryadi & Budimansyah, 2016).

The 2013 curriculum reform attempted to introduce student-centred learning to address these challenges (Muhammad et al., 2023). However, inconsistent implementation due to inadequate teacher training and ineffective leadership has perpetuated traditional methods (Suryadi & Budimansyah, 2016). As a result, Indonesian students consistently perform poorly on international assessments like PISA, particularly in reading, mathematics, and science, which all require critical thinking and problem-solving skills (OECD, 2018).

Furthermore, the lack of emphasis on critical thinking in the Indonesian education system contributes to broader societal challenges. In an increasingly globalized and competitive world, the ability to think critically is crucial for personal and professional success. Indonesian students, who are not sufficiently trained in these skills, may find themselves at a disadvantage compared to their peers in other countries where education systems prioritize critical thinking and problem-solving from an early age.

The present study titled "Influences on Critical Thinking Skills Among Indonesian Secondary Students: An Empirical Analysis" seeks to explore the factors that influence the development of critical thinking skills in Indonesian secondary students. By analysing the role of teaching methods, school leadership, and socio-economic factors, this study aims to provide insights into how Indonesian education can evolve to better support critical thinking. Understanding these influences is vital for creating policies and practices that can shift the focus from rote memorization to deeper learning, thereby improving student outcomes and addressing the country's education quality crisis. This study aims to contribute to this ongoing conversation by providing empirical evidence on the factors that can enhance critical thinking skills among Indonesian students.

# Perspectives on the Development of Critical Thinking Skills

Critical thinking, the ability to reflect and make reasoned judgments, is essential for senior secondary students facing complex academic and social challenges (Fisher, 2020). Theoretical perspectives from cognitive development to sociocultural influences explain how these skills emerge. Jean Piaget's Cognitive Developmental Theory suggests that in adolescence, students develop abstract reasoning, enabling them to approach problems logically and from multiple angles (Bjorklund, 2020; Anderson & Kratwohl, 2022). Activities like problem-solving and inquiry-based learning foster critical thinking by encouraging students to evaluate evidence and integrate ideas (Ginsburg & Opper, 2021).

Lev Vygotsky's Sociocultural Theory emphasizes that social interaction is key to learning. Through engagement with teachers or peers, students are guided within the "zone of proximal development" (ZPD) to achieve higher levels of thinking (YURTTAŞ Dilay et al., 2022). Collaborative activities such as group discussions and peer feedback nurture critical thinking by exposing students to diverse perspectives. In the modern context, digital tools play a role in this development, as students learn to critically evaluate online information (Selwyn, 2022).

The information processing theory compares the brain to a computer, highlighting how students manage cognitive tasks like filtering relevant information and handling complex ideas (Anderson & Kratwohl, 2022). Metacognitive strategies, which involve students monitoring and regulating their thinking, are key to enhancing critical thinking (Flavell, 2020). In an era of rapid technological change, critical thinking is increasingly important, helping students adapt to new information and the demands of the evolving workforce.

Pedagogical approaches such as inquiry-based, problem-based, and project-based learning are effective at promoting critical thinking. Inquiry-based learning encourages students to explore open-ended questions and assess multiple sources of information (Hattie, 2020). Problem-based learning presents real-world challenges requiring active problem-solving, while project-based learning allows students to apply interdisciplinary knowledge to extended tasks (Bell, 2019; Hmelo-Silver, 2019; Savery, 2019). However, one of the challenges with these methods is ensuring that they are implemented effectively. Inconsistent teacher training and resource limitations can hinder the proper application of these techniques, leading to superficial engagement rather than deeper learning. Additionally, while these methods encourage autonomy, students may struggle without proper guidance, risking confusion and lower engagement.

Experiential learning, which integrates real-world experiences into the learning process, also contributes to critical thinking development (Ginsburg, H.P, 2020). By engaging in hands-on activities, students can connect theoretical knowledge to practical applications (Bell, 2019; Savery, 2019). However, challenges in providing meaningful experiences across diverse educational settings can limit the impact of experiential learning. Variations in resources and opportunities, particularly in less privileged schools, can result in unequal access to such learning experiences, further contributing to disparities in critical thinking development.

Socioeconomic background, parental involvement, and school environment also shape critical thinking development. Students from higher-income families typically have greater access to resources like books and technology, which supports critical thinking (Reardon, 2011). Parental involvement, especially in discussions about current events or encouraging independent thought, plays a vital role in developing these skills (Jeynes, 2020). Schools that emphasize collaboration, inquiry, and independent learning are more likely to foster critical thinking (Darling-Hammond et al., 2019).

Teacher-student relationships are another critical factor. Teachers who model critical thinking through questioning and facilitating discussions can significantly influence students' cognitive growth. A classroom environment that encourages students to express and challenge ideas is vital for nurturing critical thinking (Zhao, 2017).

In conclusion, the development of critical thinking among senior secondary students is influenced by cognitive, sociocultural, and environmental factors. While problem-, projectbased, and experiential learning hold promise, ensuring their proper implementation remains a challenge. As technological advancements and global challenges continue to reshape the future, integrating critical thinking into education is crucial for preparing students to navigate the complexities of lifelong learning and the modern workforce.

# **Research Methodology**

This study used a cross-sectional survey to examine senior secondary schools in Bandung Raya, employing structured questionnaires. The goal was to assess how well students developed critical thinking skills through academic and non-academic activities. Critical thinking, as defined by Livermore (2009), involves the ability to analyse and collaborate across diverse perspectives, essential for fostering global citizenship. It is a key marker of successful school reforms promoting independent thinking and problem-solving (Mercer, et al. 2021).

This study gathered data through an entirely online, Google-based questionnaire, designed around Livermore's critical thinking construct and further refined using a four-scale critical thinking indicator. In collaboration with the West Java Provincial Department of Education, the team selected schools using systematic random sampling methods. Researchers also worked closely with the headmasters of the chosen schools to ensure that as many students as possible participated in completing the questionnaire.

The survey covered 74 randomly selected schools across three districts in the Bandung Raya region, including both general and vocational schools. A total of 1020 students from 69 schools were sampled, with Cimahi Municipality being excluded due to a low response rate. While the sample was not perfectly proportional between public and private schools, it provided a balanced representation of the various curriculum types and school categories in the region. This broad sampling enabled the study to offer comprehensive insights into the differences between curriculum structures and how they impact the development of critical thinking skills in students.

# **Results and Discussion**

The demographic profile of respondents from the Bandung Region in West Java, Indonesia, reflects a diverse student population. Gender distribution shows that 58.8% were female, indicating a slightly higher female enrolment in the sampled schools. Most students were 16 years old (43.2%), followed by 17-year-olds (29.0%), with smaller percentages for other age groups. This suggests the survey primarily captured students in their mid-high school years, a crucial period for educational and career decisions. In terms of grade level, 46.0% were in Grade 11, 36.8% in Grade 10, and 17.3% in Grade 12, further emphasizing that many respondents were midway through secondary education.

School type and status also offer valuable insights. Public vocational secondary schools accounted for 40.1% of respondents, while 39.2% attended public general secondary schools which is balanced to the student and school profiles. Private schools represented smaller proportions, with 15.6% in private general and 5.2% in private vocational schools, highlighting a strong reliance on public education and a notable emphasis on vocational training. Most respondents were from urban areas (83.3%), and the rests were from rural areas, reflecting the Bandung Region is now becoming metropolitan areas and more urban-centred educational access in Bandung. Regarding family income, 46.5% came from middle-income households, with a majority of students also having early childhood education (73.6%), underscoring its role in shaping their academic paths. Parental education, and 33.8% holding a diploma or bachelor's degree.

Overall, these demographic insights reveal a predominantly urban, middle-income student population, with diverse educational backgrounds and parental education levels shaping their academic experiences in the Bandung Region. This reflect that the development of critical thinking has not only been affected by schools but also home and demographic factors.

# Factors That Impact the Variability of Global Mindset Scores

The multiple regression model is employed in the analysis of influencing factors on the critical thinking scores of Indonesian senior secondary students. The model was built to assess how students' characteristics (such as gender, age, grade level, and preschool education), demographic profiles (including rural-urban residence and family socio-economic status), and school-related factors (such as school management, learning content, teacher competence, and learning approach) interact in shaping students' critical thinking measures. The analysis indicates that the model explains 17,9% of the variance in students' critical thinking which is considrably high in social reserach but remains ssignificant.

The findings provide insights into which factors play a critical role in shaping students' global awareness, suggesting a complex interaction of personal, familial, and educational influences. The results of regression model are described in Table 1.

Regression Model		Beta	t	Sig.
(Constant)			-6.602	.000
1.	Sex of student	.037	1.290	.197
2.	Age of Student	.072	1.665	.096*)
3.	Preschool attendance	.114	3.759	.000**)
4.	Monthly Family Income	.033	.942	.346
5.	Parental Education	.075	2.101	.036*)
6.	Grade Level	056	-1.236	.217
7.	School Type	.072	2.194	.028*)
8.	School Status	023	756	.450
9.	Participative School Management	.098	2.841	.005*)
10.	Learning Content	.075	2.225	.026*)
11.	Teacher Credential	015	440	.660
12.	Project-based learning	.308	10.168	.000**)

Table 1: Impacts of Demographic and School Factors on Indonesian Secondary S	tudents'
Critical Thinking Skills	

Dependent Variable: critical thinking score; p. 0,05\*); p. 0.001\*\*)

The regression analysis identifies several key factors that significantly influence critical thinking scores among senior secondary students. Notably, preschool attendance and project-based learning emerge as the most impactful predictors. The analysis shows that preschool attendance has a strong positive coefficient (B=2.032, p<.001), indicating that students who attended preschool score significantly higher in critical thinking assessments. This underscores the importance of early educational experiences, as research suggests that preschool environments, which emphasize play and exploration, foster foundational cognitive skills that benefit students in later academic contexts (Whitebread et al., 2015).

Similarly, project-based learning has a strong positive effect (B=1.364, p<.001), underscoring its effectiveness in enhancing critical thinking skills. This approach engages students in real-

world problem-solving and collaborative projects, fostering deeper cognitive engagement by requiring them to analyze and apply knowledge in meaningful ways (Thomas, 2000; Pajares et al., 2006). This is especially relevant in an era of disruption and change driven by digitalization in all aspects of life (Schwab, 2016). The high t-value of 10.168 further reinforces the significance of this predictor, indicating a strong level of statistical reliability.

The type of school (private vs. public school) attended also correlates positively with critical thinking scores (B=1.283, p=.028). This suggests that the school environment can significantly impact students' cognitive development. Different school types often offer varying resources and teaching approaches, which can lead to differences in student outcomes. This study demonstrates that the public-school environment has a more positive impact on the development of students' critical thinking skills. Evidence indicates that students in resource-rich mostly in public schools may receive more individualized attention, contributing to improved critical thinking outcomes (Cain, 1983).

Parental education levels show a significant positive relationship with critical thinking scores (B=0.706, p=.036). This implies that students with more educated parents tend to perform better in critical thinking assessments. Educated parents are more likely to create intellectually stimulating environments at home, fostering critical engagement and academic support (Sirin, 2005). Parents with higher education levels often possess greater cultural capital, that significantly influences children's academic performance and cognitive development (Lareau, 2011; Pajares et al., 2006). This cultural capital may manifest in various forms, educated parents are more likely to introduce their children to books, educational activities, and experiences that not only enhance their children's critical thinking skills but also contribute to their overall academic success.

Effective school management plays a crucial role in enhancing students' critical thinking abilities. The analysis reveals a positive coefficient for school participative management (B=0.415, p=.005), indicating that schools with strong participative management practices are associated with higher critical thinking scores. Research has shown that effective leadership positively influences educational outcomes, including critical thinking (Leithwood et al., 2004). Schools managed in a participative manner increase the likelihood that students will engage in school activities, which can further boost their critical thinking skills.

Furthermore, learning content positively impacts critical thinking scores (B=0.415, p=.026). Students who achieve higher scores in critical thinking assessments are often engaged in problem- or project-based learning activities that focus on thematic and relevant issues. This underscores the importance of a curriculum that promotes critical analysis and the application of knowledge, which is essential for developing cognitive skills (Resnick, 1987). The t-value of 2.225 indicates that this relationship is statistically significant, highlighting the need for rigorous educational content.

While some factors, such as the sex of the student (p=.197) and age (p=.096), did not show significant effects on critical thinking scores, this suggests that educational experiences may outweigh demographic variables in influencing cognitive development. This aligns with findings that indicate the educational experiences received in school might be more critical than gender differences in determining students' critical thinking abilities (Lareau, 2011).

Teacher credential did not affect significantly on student's critical thinking scores effect (B=.440, p<.660). Other research suggests that the effectiveness of a teacher is more closely

linked to their instructional practices than to their formal credentials. For example, teachers who employ active learning strategies—such as inquiry-based or project-based learning—are more likely to enhance critical thinking skills among their students, regardless of their academic qualifications (Darling-Hammond et al., 2019). This aligns with findings that show pedagogical approaches have a greater influence on student outcomes than mere credentials (Hattie, 2020).

In conclusion, this analysis highlights the multifaceted nature of critical thinking development among senior secondary students. The significance of early childhood education, innovative teaching methods like project-based learning, and supportive family and school environments indicate that a comprehensive approach is essential for fostering critical thinking skills. Promoting these factors could lead to substantial improvements in students' cognitive abilities, better preparing them for future academic and life challenges.

#### Conclusion

The article "Influences on Critical Thinking Skills Among Indonesian Secondary Students" examines the challenges within Indonesia's education system, particularly its reliance on rote learning and teacher-centred instruction, which hinders the development of critical thinking. Despite efforts to introduce student-centred learning through the 2013 curriculum reforms, poor implementation due to insufficient teacher training has perpetuated traditional methods. This has led to Indonesian students performing poorly in international assessments like PISA, where critical thinking is essential.

The study identifies factors that significantly influence critical thinking development, including preschool attendance, project-based learning, and participative school management. Early childhood education and innovative teaching methods like project-based learning show strong positive impacts on students' critical thinking abilities. Socioeconomic status, parental education, and school environments also play critical roles, with students from more privileged backgrounds generally having better access to resources that foster cognitive development. However, factors like gender and teacher credentials were not found to significantly affect critical thinking outcomes.

The study suggests that a comprehensive approach is necessary to improve critical thinking among Indonesian students, emphasizing the need for more effective teacher training, better school management, and equitable access to educational resources.

For future research, it is recommended to explore how digital tools and technologies can further enhance critical thinking in Indonesian classrooms. Additionally, longitudinal studies could provide deeper insights into the long-term impact of early childhood education and innovative pedagogical approaches on students' critical thinking development across different regions and socio-economic backgrounds. This would help refine strategies to bridge the gap between privileged and underprivileged schools in Indonesia.

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# Transforming Vocational Education Through Cybergogy: Research Trends and Impacts Over the Last Decade

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#### Abstract

The rapid advancement of technology underscores the need for vocational education institutions to adopt digital learning approaches. However, many vocational institutions still rely on traditional teaching methods. This reliance on outdated approaches contributes to a significant skills gap, where graduates often lack the digital competencies and adaptability required by today's industries. This study aims to identify trends and relationships among topics in the application of cybergogy a method that combines cybernetics with pedagogy in vocational education. Through a comprehensive bibliometric analysis using tools like Publish or Perish and VOSviewer, this research examines publications from 2013 to 2023. This dataset includes 162 papers, which collectively have garnered a total of 3,511 citations. Notably, the research reveals a marked increase in publication frequency starting in 2020, likely correlating with the increased push towards digital integration in vocational education triggered by the COVID-19 pandemic. This analysis outlines several key research clusters, including innovative learning methodologies, pedagogical strategies, student engagement, and the implementation of digital frameworks within educational settings. The findings emphasize the innovative nature of this research, positioning cybergogy not just as a novel educational method but as an essential foundation for developing forward-looking vocational education strategies. These insights pave the way for further investigation into effective digital integration in vocational learning environments, aiming to bridge the skills gap and enhance educational outcomes in line with the demands of the modern workforce.

Keywords: Vocational Education, Cybergogy, Bibliometric Analysis, Publish or Perish, VOSViewer

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# Introduction

Vocational education is crucial for equipping graduates with the skills necessary to thrive in a workforce that is continually transformed by rapid technological advancements. However, many vocational institutions are still entrenched in traditional teaching methodologies, which often fall short in preparing students with the essential digital skills and adaptability required by today's industries. This disconnect results in a significant skills gap among graduates, highlighting the urgent need for vocational colleges to embrace digital transformation to cultivate a workforce capable of meeting contemporary industry demands (Deng & Badiane, 2021).

The integration of digital teaching resources can significantly enhance the flexibility and interactivity of the educational experience, which is vital for preparing students to navigate the dynamic challenges of the modern workplace (Feng, 2024). Additionally, it is imperative to focus on improving educators' digital competencies, as this plays a critical role in bridging the existing skills gap in this digital era (Wei, 2024). Moreover, fostering collaboration with industry stakeholders is essential to ensure that educational curricula remain relevant and closely aligned with the evolving demands of the labor market (Setiyawami et al., 2020).

The effectiveness of vocational education is largely dependent on its ability to provide direct, practical training that prepares individuals for specific roles within the workforce, thereby enhancing their employability (Yoto, 2021). Strategic partnerships with relevant industries are also crucial as they can significantly mitigate the skills gap among graduates by ensuring that the training provided is directly applicable to current industry needs (Khoerunnisa et al., 2020). Consequently, this study aims to explore the trends, contributions, and impacts of cybergogy-related research through a bibliometric analysis. This approach is intended to lay a solid foundation for the development of effective digital learning strategies and serve as a comprehensive reference for researchers and practitioners aiming to design vocational education systems that are well-aligned with the demands of the digital era and industry needs.

# Methods

This study employs bibliometric analysis to explore the relationship between cybergogy and vocational education within modern educational paradigms. Utilizing Publish or Perish and VOSviewer tools, this research systematically examines trends, authorship, and interconnections in this field (Donthu et al., 2021; Ellegaard & Wallin, 2015). Based on data from 2013 to 2023, the analysis identified 162 publications with a total of 3,511 citations, averaging 319.18 citations per year and 21.67 citations per publication. These findings are anticipated to offer valuable insights for developing learning strategies that align with industry demands, thereby enhancing the quality and relevance of vocational education.

# **Result and Discussion**

# **Research Trends in Vocational Education and Cybergogy**

The bibliometric analysis conducted on the topics of "Vocational Education" and "Cybergogy" in journal publications from 2013 to 2023 revealed substantial engagement in this research area. Based on Publish or Perish data, 162 papers garnered a total of 3,511 citations, averaging 319.18 citations per year and 21.67 citations per paper, indicating a

consistent interest in this field. The average number of authors per paper was approximately 2.70, highlighting a collaborative research trend. Key metrics include an h-index of 24, meaning 24 papers received at least 24 citations each, and a g-index of 57, reflecting a strong presence of highly cited publications that shape the field's citation landscape.

Additionally, the age-weighted citation rate was 1,044.61, suggesting that citations are significantly weighted toward recent publications, further underscoring a growing interest in the integration of cybergogy within vocational education. The high percentage coverage of citations within the h-index (82.5%) and g-index (94.8%) indicates that most citations are attributed to influential, core studies, marking this research area as both impactful and increasingly relevant in educational paradigms. The table below (Table 1) presents the most-cited articles in the field.

Cites	Authors	Title	Year	GSRank
623	Sarstedt, M., et al.	Beyond a tandem analysis of SEM and PROCESS: Use of PLS-SEM for mediation analyses!	2020	148
447	do Valle, P. O., & Assaker, G.	Using partial least squares structural equation modeling in tourism research: A review of past research and recommendations for future applications	2016	147
437	Al Husaeni, D. F., & Nandiyanto, A. B. D.	Bibliometric Using Vosviewer With Publish or Perish (Using Google Scholar Data): From Step-By-Step Processing for Users to The Practical Examples In The Analysis of Digital Learning Articles in Pre and Post Covid-19 Pandemic	2022	31
247	Ramírez-Montoya, M. S., et al.	Complex thinking in the framework of Education 4.0 and Open Innovation—A systematic literature review	2022	34
138	Berge, Z. L.	Barriers to communication in distance education	2013	86

Table 1: Journal Article Search Results Based on the Most Citations

In contrast, the second table (see Table 2) showcases the articles with the greatest relevance and impact according to Google Scholar (GS) rankings, indicating their influence within the academic community.

Cites	Authors	Title	Year	GSRank
15	FR Baharuddin,	Andragogy, Peeragogy, Heutagogy and Cybergogy	2023	1
	W Setialaksana	Contribution on Self-Regulated Learning: A		
		Structural Equation Model Approach.		
23	RA Rahma, Y	Cybergogy as a Digital Media to Facilitate the	2021	2
	Affriyenni, M	Learning Style of Millennial College Students.		
	Widyaswari			
0	A Amiruddin, FR	Pedagogy-Andragogy Continuum with Cybergogy	2023	3
	Baharuddin, T	to Promote Self-Regulated Learning: A Structural		
	Takbir	Equation Model Approach		
23	JA Malek	The impact of heutagogy education through	2017	4
		telecentre in smart village (SV)		
8	M Mureșan	Collaborative learning and cybergogy paradigms for	2015	5
		the development of transversal competences in		
		higher education		

Table 2: Journal Article Search Results Based on Google Scholar Rank

The following presents the annual number of publications and a graph illustrating the research progression on this topic.



Figure 1: Trend Graph of This Topic

The analysis of article trends from 2013 to 2023 reveals a significant increase in publications discussing the topics of "Vocational Education" and "Cybergogy." In the initial years, from 2013 to 2015, the number of publications was relatively low and stable, with only 4 articles each year. A slight increase to 6 articles was observed in 2016, but the numbers remained fluctuating until 2019.

A major shift occurred in 2020, with the number of publications surging to 23 articles. This upward trend continued steadily, maintaining the same count in 2021 and then rising sharply to 37 articles in 2022. The peak was reached in 2023 with 42 articles.

This consistent growth, particularly after 2019, indicates a rising interest and focus on cybergogy within vocational education research. This trend can be interpreted as a response to the need for more digitally integrated educational approaches, highlighting the relevance and importance of this topic in modern educational paradigms.

#### **Research Connections and Novelty**

The VOSviewer visualization (see Figure 1) shows that "cybergogy" and "learning" have become central themes in vocational education research, with high density indicating a primary focus in this area. Terms such as "education," "teaching," "student," and "development" also appear dominant, indicating a close connection with the concept of cybergogy. The network visualization (see Figure 2) reveals several thematic clusters, including a cluster around "cybergogy" and "learning" associated with education, teaching, and learning; a cluster focused on the role of educators with terms like "teacher," "pedagogy," and "heutagogy"; and a cluster related to student engagement and learning outcomes. The numerous connections between clusters suggest a collaborative and interdisciplinary approach to exploring cybergogy in vocational education. Based on the overlay visualization (see Figure 3), terms like "learner engagement" and "framework" appear in brighter colors, indicating recent research trends, particularly in digital learning methods and student engagement strategies that have emerged in response to the COVID-19 pandemic.



Figure 2: Density Visualization



Figure 3: Network Visualization



Figure 4: Overlay Visualization

This visualization depicts cybergogy as a central and continuously evolving theme in vocational education research, with strong connections to learning processes, pedagogy, and new shifts toward student engagement and digital frameworks, likely accelerated by the COVID-19 pandemic. This analysis highlights a trend toward integrating digital learning tools and adaptive frameworks, underscoring the relevance of this field within modern educational paradigms. Overall, these connections indicate the novelty of research in which cybergogy not only serves as an innovative learning approach but also as an essential foundation for developing vocational education strategies that are responsive to changing times.

#### Conclusion

This study highlights the prominence and dynamic evolution of cybergogy as a central theme in vocational education research, particularly noting its strong linkages to modern pedagogical strategies, learning processes, and new directions in student engagement and the adoption of digital frameworks. The observed surge in related publications since 2020 underscores a burgeoning interest among educational researchers and practitioners in harnessing digital learning methodologies to address the current and future needs of the industry. The VOSviewer visualizations provide a clear depiction of thematic clusters, underscoring a collaborative and interdisciplinary effort to probe the depths of cybergogy within the context of vocational education. These clusters not only map the existing research landscape but also suggest areas ripe for further exploration and development.

Moreover, these findings underscore the innovative nature of cybergogy, establishing it not merely as a modern teaching tool but as a fundamental pillar in the formulation of effective and responsive vocational education strategies. This is particularly relevant in adapting to the rapid shifts seen in the post-pandemic era, where digital tools and approaches are increasingly seen as critical to educational success and relevance in the digital age. By aligning educational strategies with the evolving demands of the workforce, cybergogy can play a pivotal role in equipping students with the skills necessary to thrive in a continually changing professional environment. This study serves as a call to action for continued research and application of cybergogy, to ensure vocational education remains at the forefront of educational innovation and workforce development.

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# Mapping the Landscape of Educational Laws, Regulations, and Policies: A Bibliometric Review for New Research Insights

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#### Abstract

This research aims to evaluate the development of research on educational laws, regulations, and policies using bibliometric mapping methods through the VOSviewer application. The articles were obtained from the Google Scholar database by searching for keywords such as "education law, education regulation, education policy" using Harzing's Publish or Perish application with the aim of identifying research trends in the field of educational laws, regulations, and policies. The study analyzed the Google Scholar database for a period of 10 years (2013-2023) and resulted in 999 articles. The analysis showed that the research trend in this topic has been continuously declining over the past few years, from 2013 to 2019. However, there was an increase in the trend in 2019 with an increase in the number of studies on this topic, which continued until 2020. After 2020 until 2023, there was a decrease again. In addition to frequently occurring keywords such as "education law, education regulation, education policy", there were also several research topics that appeared quite often, such as "Teaching" with a total of 350 occurrences and 300 links, "Learning" with a total of 313 occurrences and 303 links, "Student" with a total of 160 occurrences and 262 links, "Act" with a total of 147 occurrences and 254 links, and "Higher Education" with a total of 125 occurrences and 234 links. Based on these findings, it can be concluded that this study has the potential to serve as a basis for developing other research topics related to educational laws, regulations, and policies.

Keywords: Education Law, Bibliometric, VOSviewer

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### Introduction

Education is a pivotal factor in the progress of any nation, serving as the cornerstone for both individual and societal advancement. Within this context, educational law plays an indispensable role by providing the necessary legal framework to regulate, protect, and address diverse issues that arise within the educational sector (Triningsih, 2017; Perna, et al., 2012; Indrasti & Jalil, 2019). These laws are intricately designed and periodically updated with the intention of enhancing the overall quality of education. However, despite these efforts, the implementation of educational laws often encounters significant challenges that can impede the development of an equitable and just education system. Such challenges include persistent educational disparities and injustices that prevent the achievement of a truly fair educational landscape (Wartoyo, 2016).

The study of educational laws is therefore not just about comprehending the existing legal frameworks but also about actively identifying and addressing the gaps and barriers that hinder their effective application. This involves a critical analysis of how laws interact with educational policies and practices on the ground, as well as examining their impact on various stakeholders including students, educators, and institutions. By doing so, this field of study aims to provide well-grounded solutions and informed recommendations that can significantly improve educational outcomes. These enhancements are crucial for overcoming the prevailing challenges and for fostering an environment where the rights to education are genuinely upheld and accessible to all. Through such rigorous scholarly examination, the study of educational law aspires to catalyze reforms that will not only rectify current shortcomings but also adaptively respond to the evolving educational demands of modern societies.

As a field of study, educational law encompasses regulations that govern the rights, obligations, and responsibilities of all parties within the educational system, with the primary goal of ensuring a fair, effective, and efficient operation of the system (Kaplin et al., 2019; Kaplin et al., 2020). These regulations serve as the backbone of the educational framework, striving to create a balanced and just environment that promotes optimal learning outcomes. One of the foremost challenges within this realm is the establishment and definition of clear standards that measure and regulate the quality of education (Blackmur, 2007). Such standards are crucial for maintaining educational integrity and ensuring that institutions deliver a high level of educational quality that meets national and international benchmarks.

Moreover, political policies significantly influence the development of the educational system, encompassing the state's proactive role in crafting and upholding a quality system (Nuraini et al., 2019). These policies are instrumental in setting the direction of educational strategies and reforms, which directly impact the operational aspects of education at various levels. Clear, structured regulations are thus indispensable for providing clarity and guidance to all stakeholders involved, ensuring that everyone, from school administrators to teachers and students, understands their rights and duties.

The comprehensive understanding and enforcement of these laws are critical for safeguarding students' rights, which include access to quality education free from discrimination and protection against violence in schools (Salakhova et al., 2021; Jacob et al., 2022). Addressing these issues through well-defined legal structures helps in creating safer, more inclusive educational environments where students can thrive without fear of bias or harm. Therefore, educational law not only seeks to lay down the legal underpinnings for school operations and
educational practices but also aims to adapt and respond to the evolving educational needs and challenges of society, ensuring that all individuals can benefit from equitable educational opportunities.

## Methods

The method employed in this study involved a bibliometric analysis to review research trends related to educational laws, regulations, and policies during the 2013 to 2023 period. Data collection was conducted using the Publish or Perish application, which gathered information from the Google Scholar database, ensuring the inclusion of citations and patents. The keywords used included "education law," "education policy," and "education regulation," filtered by publication type (journal) and year (2013-2023). A total of 999 articles were analyzed using VOSviewer to map trends, authorship patterns, and relationships within this field of research (Donthu et al., 2021; Ellegaard & Wallin, 2015). Metrics such as the h-index, g-index, and age-weighted citation rate were assessed to provide insights into the impact and interconnectivity of the publications.

#### **Publication Data Search Results**

In order to search for data related to the topic of educational laws, regulations, and policies, education regulation, and education policy," the researcher used the Harzing Publish or Perish application to access the Google Scholar database. As a result, 999 articles were found that met these criteria. The accessed data included information regarding the number of citations, authors, titles, abstracts, year, source, publication, article URL, citation URL, Google Scholar Ranking, access time, file type, DOI, and ISSN.

In this study, the researcher used Google Scholar Ranking as the main metric based on the number of citations received by scientific publications from an institution or individual. In addition, other metrics such as H-index, G-index, M-index, and CPP (Citation per Paper) were also used to obtain a more complete picture. The results of these metric analyses obtained through the Harzing Publish or Perish application from Google Scholar metadata showed a total of 295,345 citations, 29,534.50 citations per year, 295.64 citations per article, 2.47 authors per article, an h-index of 290, and a g-index of 454. Table 1 shows some example data taken from the top 10 articles based on Google Scholar Ranking.

No.	Authors	Title	Year	Cites	Refs
1	P McGuinn	From no child left behind to the every student succeeds act: Federalism and the education legacy of the Obama administration	2016	265	(McGuinn, P., 2016)
2	J Arthur	Extremism and neo-liberal education policy: A contextual critique of the Trojan horse affair in Birmingham schools	2015	97	(Arthur, J., 2015)
3	D Hursh	Raising the stakes: High-stakes testing and the attack on public education in New York	2013	179	(Hursh, D., 2013)
4	CK Gilbert & DE Heller	Access, equity, and community colleges: The Truman Commission and federal higher education policy from 1947 to 2011	2013	238	(Gilbert, CK, & Heller, DE., 2013)
5	P Agarwal, G Kamalakar	Indian higher education: Envisioning the future	2013	441	(Agarwal, P, & Kamalakar, G., 2013)
6	I Hardy, S Woodcock	Inclusive education policies: Discourses of difference, diversity and deficit	2015	339	(Hardy, I, & Woodcock, S., 2015).
7	MM Burke	Improving parental involvement: Training special education advocates	2013	181	(Burke, MM., 2013)
8	F Caena	Teacher Competence Frameworks in Europe: policy as discourse and policy as practice	2014	207	(Caena, F., 2014)
9	J Nilsson, N Bunar	Educational responses to newly arrived students in Sweden: Understanding the structure and influence of post-migration ecology	2016	222	(Nilsson, J, & Bunar, N., 2016)
10	J Mehta	How paradigms create politics: The transformation of American educational policy, 1980–2001	2013	351	(Mehta, J., 2013)

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#### **Research Development in the Field of Educational Laws, Regulations, and Policies**

Table 2 shows the development of research topics on educational laws, regulations, and policies based on Google Scholar metadata from 2013 to 2023. The table indicates a total of 999 articles, with 231 articles in 2013, 183 articles in 2014, 160 articles in 2015, 127 articles in 2016, 83 articles in 2018, 66 articles in 2019, 51 articles in 2020, 75 articles in 2021, 15 articles in 2022, and 3 articles in 2023. These data illustrate the progression of research topics in educational law over a 10-year period.

Year of Publication	Number of Publication
2013	231
2014	183
2015	160
2016	127
2017	83
2018	66
2019	51
2020	75
2021	15
2022	5
Total	999

Fig. 1. illustrates that the development of research on educational law from 2013 to 2023 shows a decline. The graph indicates that this topic has consistently experienced a decline in the number of research publications in recent years, from 2013 to 2019. However, in 2019, there was an increasing trend with the rising number of research studies on this topic, and the trend continued until 2020. Nevertheless, there was a decline again from 2020 to 2023.



Figure 1: Level of Development in Educational Laws, Regulations, and Policies Research

#### Visualization Educational Laws, Regulations, and Policies Topic Area Using VOSviewer

Clusters have a significant role in bibliometric analysis as they represent specific fields or sub-fields within a discipline. They are groups of related objects in a network that have similar characteristics, such as topic or theme, and are used to identify related groups of publications, authors, or journals. These techniques have been primarily developed in network science, computer science, and statistics (Van Eck & Waltman, 2017). VOSviewer uses color to differentiate between clusters and automatically assigns distinct colors to each cluster for easy identification. Moreover, the size of circles represents the number of publications or authors within a cluster (Gillani et al., 2022). In this research, nine clusters have been identified based on the titles and abstracts of scientific publications used in the bibliometric analysis.

- (i) Cluster 1 contains 54 items, cluster 1 is marked in red. The 54 items are 21st century, action, area, care, casual, effect, change, country, education, education system, educational attainment, educational outcome, educational reform, educational system, effect, effectiveness, evidence, extent, family, financial, education, foundation, game, health, higher level, implementation, knowledge, learning experience, life, meta-analysis, ministry, nurse, outcome, paper, policy, program, provision, range, reform, regulation, role, rule, schooling, skill, society, stress, study, systematic literature review, task, teaching method, teaching practice, term, training, variety, woman, year.
- (ii) Cluster 2 contains 46 items, cluster 2 is marked in green. The 46 items are academic success, addition, american, attitude, autism spectrum disorder, barrier, college student, concern, culture, determinant, disabilities education act, disability, education act, effective teaching, efficacy, engineering, entrepreneurial intention, entrepreneurship, entrepreneurship education, fact, field, idea, identity, inclusive education, individual, institution, law, level, mathematics, mathematics education, need, participation, place, plan, process, project, prospect, science, sense, service, special education, stem, stem education, theory, time, young person.
- (iii) Cluster 3 contains 38 items, cluster 3 is marked in blue. The 38 items are access, active learning, age, analytic, best practice, bilingual education, challenge, commitment, communication, community, competency, consequence, content, data, education level, educational institution, environment, gender, hand, human capital, influence, innovation, language, legislation, organization, participant, patient, person, power, problem, regulatory body, review, situation, system, teacher, thing, way, world.
- (iv) Cluster 4 contains 37 items, cluster 4 is marked in yellow. The 37 items are achievement, activity, author, collaborative learning, college, concept, conceptual framework, context, course, educational leadership, educational practice, educational technology, engagement, external regulation, faculty, goal, involvement, learning, learning environment, lens, model, motivation, online learning, parent, parental involvement, physical education, present study, relationship, research, school, self, self-regulation, strategy, student engagement, survey, systematic review.
- (v) Cluster 5 contains 34 items, cluster 5 is marked in purple. The 34 items are adolescent, application, article, blended learning, case, competence, development, educational research, emphasis, evolution, example, guideline, higher education institution, history, ict, information, integration, interprofessional education, lifelong learning, literature, literature review, medical education, pedagogy, point, principle, regulatory framework, secondary education, social medium, teacher education, teaching, technology, tool, trend, use.
- (vi) Cluster 6 contains 34 items, cluster 6 is marked in light blue. The 34 items are accountability, act, analysis, approach, assessment, australia, belief, contribution, critical review, diversity, education policy, educational setting, equity, evaluation, form, future, inclusion, inequality, issue, leadership, lesson, no child, performance, public education, pupil, rationale, student achievement, student learning, sustainability, sustainable development, type, university, usa, work.
- (vii) Cluster 7 contains 33 items, cluster 7 is marked in light orange. The 33 items are benefit, case study, child, china, control, curriculum, degree, difference, discourse, early childhood education, educational experience, employment, experience, higher education, implication, india, interest, opportunity, order, perspective, play, possibility, qualitative study, quality, researcher, resource, staff, student, support, united states, view, vocational education, youth.

- (viii)Cluster 8 contains 24 items, cluster 8 is marked in light brown. The 24 items are covid, distance, distance learning, e-learning, england, factor, focus, government, home, impact, importance, indonesia, lack, learner, learning process, matter, online, online education, online teaching, pandemic, part, perception, primary school, science education.
- (ix) Cluster 9 contains 18 items, cluster 9 is marked in light pink. The 18 items are ability, consumer, creation, educational policy, esea, framework, nature, number, practice, race, reflection, relation, response, secondary education act, state, transformation, value, classroom.

Among the identified clusters, there are several research topics that have the potential to be developed into new studies, which can increase the trend of research in the field of educational law. In the visualization of related articles using VOS viewer, 318 items, 9 clusters, 11,920 links, and a total link strength of 24,521 were found. The mapping is divided into 9 clusters that represent the classification of total items. Cluster 1 has 54 items, indicating that this cluster has the most complex and numerous relationships with other studies, while cluster 9 has the smallest number of items with 18 items. According to Nandiyanto, A. B., D., et al. (2021), each term is assigned a colored circle label, with the size of the circle varying based on the frequency of the term's occurrence. The size of the label circle indicates a positive correlation with the term's appearance in titles and abstracts (Chun, 2009). The more frequently a term is found, the larger its label size. (Al Husaeni & Nandiyanto, 2022). Educational laws, regulations, and policies are related to various fields of study and other research areas. The results of the analysis using VOS viewer software show three types of visualization mapping: network visualization (see Fig. 2), density visualization (see Fig. 3), and overlapping visualization (see Fig. 4).

Fig. 2 shows a network visualization that illustrates the relationships between various terms, such as augmented reality and education, and other study topics. Each cluster is represented by a different color. VOS Viewer is a software that enables us to create bibliometric maps that are easy to understand. It can analyze various types of bibliometric analyses and supports major bibliographic databases. However, it is limited to analyzing small to medium-sized data and intended for text processing functions. The visualization techniques used include layout and cluster techniques, as well as overlay and density visualization features. (Nandiyanto & Al Husaeni, 2021; Al Husaeni & Nandiyanto, 2022). Furthermore, Fig. 2 displays different terms that are frequently used in research and related to educational laws, regulations, and policies. If a term does not have any connecting lines to other terms, it means that the topic has not been studied further by researchers or is a new novelty in research.

Fig. 2 illustrates the relationship between educational laws, regulations, and policies and other study topics through a network visualization. Each cluster is represented by a different color. VOS Viewer software can create large bibliometric maps that are easy to interpret. It can analyze various types of bibliometric analyses, support major bibliographic databases, and disregard the time dimension. However, it is intended for text processing functions and limited to analyzing small to medium-sized data. The visualization techniques used include layout and cluster techniques, as well as overlay and density visualization features (Nandiyanto & Al Husaeni, 2021; Al Husaeni & Nandiyanto, 2022). Furthermore, Fig. 2 displays various terms that are frequently used in research and related to educational laws, regulations, and policies. If a term does not have any connecting lines to other terms in the visualization, it indicates that the corresponding topic has not been extensively researched or is a new novelty in the field. Additionally, a larger size of a term indicates that it has been

discussed in more research topics. Furthermore, if the position of the term is farther away, it means that the relation with the current research topic is more distant.



Figure 2: Network Visualization of Educational Laws, Regulations, and Policies Keyword

There is an overlay visualization in Figure 3 that displays the distribution of research topics based on the year of publication (Rahayu et al., 2022; Ekaputera, 2022), particularly related to education laws, regulations, and policies. It can be seen from the figure that dark blue color represents research topics published in 2015-2016, green color represents research topics published in 2016-2017, and yellow color represents research topics published in 2017-2023. This visualization provides an overview of the development of research topics over a certain period of time, which can provide insights for researchers and academics in understanding research trends and identifying research gaps that need to be further explored.



Figure 3: Overlay Visualization of Educational Laws, Regulations, and Policies Keyword

Fig 4. Density visualization shows the relationship between specific terms, particularly related to educational laws, regulations, and policies, as well as other research topics. The density visualization explains the trends in research that are frequently and infrequently studied, where the brighter the color, the more frequently the research topic is discussed, and conversely, the darker the color, the less the research topic is studied (Nandiyanto et al., 2021), Fig. 4 shows the research topics that are often discussed in relation to the specified keywords, and also lists other topics that have not been widely studied, which can be seen in the clustering section above.



Figure 4: Density Visualization of Educational Laws, Regulations, and Policies Keyword

There are various topics that can be discussed related to educational law, but this research focuses on developing topics that are closely related to the keywords, such as "Teaching" with a total of 350 occurrences and 300 links, "Learning" with a total of 313 occurrences and 303 links, "Student" with a total of 160 occurrences and 262 links, "Act" with a total of 147 occurrences and 254 links, and "Higher Education" with a total of 125 occurrences and 234 links. In addition, the clustering also reveals new research topics that can be explored in future studies.

# Conclusion

The comprehensive literature review in this study highlights the emergence of numerous new research topics in the field of educational law, regulation, and policy. Despite a decline in the number of studies from 2013 to 2023, there remains a vast array of underexplored areas that present opportunities for significant scholarly contributions and potential impact on policy-making and educational practices.

These findings underscore the dynamic nature of educational law and its continuing relevance, suggesting that this field is ripe for further research. Exploring these topics is essential not only for advancing academic knowledge but also for enhancing the efficacy of educational systems worldwide. The potential for growth and increased research interest in educational law, regulation, and policy is promising, indicating a robust future for studies in this area.

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# Research Trends in Accounting and Accounting Education Over the Past Decade: A Bibliometric Analysis

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#### Abstract

This study aims to examine the trends and developments in the field of accounting and accounting education over the past decade using a bibliometric approach. The data analyzed includes publications from 2013 to 2023, focusing on research trends, contributions, and impacts. The analysis was conducted using Publish or Perish and VOSviewer tools. The results from Publish or Perish analysis showed 998 articles with a total of 61349 citations, averaging 5577.18 citations per year and 61.35 citations per article. The Hirsch h-index reached 131 and the Egghe g-index was 217, indicating the significant quality and impact of publications in this field. The average citations per author were 30666.95 with an average of 535.81 papers per author. Further analysis using VOSviewer identified 131 items clustered into 5 clusters, with a total of 4421 links and a total link strength of 12655. These results indicate a strong and collaborative research network among researchers in this topic. In addition to providing a comprehensive overview of research trends in the field of accounting and accounting education, the findings also highlight significant opportunities for future research innovation. The VOSviewer analysis shows that there are still many unexplored research opportunities that could lead to the development of new methods and approaches in accounting and accounting education research. This underscores the need for innovation in future research to fully leverage the existing potential and enhance the quality of research and practice in this field.

Keywords: Accounting Education, Bibliometric Analysis, Research Trends, Publish or Perish, VOSviewer

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# Introduction

Over the past decade, the fields of accounting and accounting education have undergone profound transformations, driven by rapid technological advancements, the forces of globalization, and evolving regulatory frameworks. Accounting's critical role in promoting transparency and accountability has necessitated sweeping educational reforms aimed at equipping future professionals with the adaptive and innovative skills necessary to navigate this complex landscape (Lawson et al., 2013). The widespread integration of digital technologies has significantly reshaped teaching methodologies, a shift that was further accelerated by the COVID-19 pandemic, which underscored the importance of online and blended learning environments for continuity and accessibility in education (Kuznetsova, 2021; Cuc, 2022).

The advent of FinTech and the increasing reliance on data analytics have profoundly influenced both the practice of accounting and its curricula, stressing the need to prepare students for a future dominated by data-driven decision-making (Feng & Wang, 2022). Research indicates that the strategic use of digital platforms can greatly enhance student engagement and learning outcomes, provided that the selection of these tools is thoughtfully aligned with specific educational goals and learning objectives (Fox et al., 2018; Bastos et al., 2021).

Furthermore, the trend towards increased globalization has expanded the scope and complexity of accounting education, emphasizing the necessity to address a broader spectrum of regulatory contexts and to foster interdisciplinary approaches that can enhance analytical and strategic thinking skills (Marrone et al., 2020; Yu & Rha, 2021). Utilizing bibliometric tools such as Publish or Perish and VOSviewer, this study has mapped out the prevailing research trends within the domain, revealing critical collaborations and pinpointing emerging opportunities for future innovation and methodological advancements (Aprianti, 2023). This introductory exploration sets the stage for a deeper understanding of the dynamic interplay between evolving educational needs and the professional demands of the accounting field, providing valuable insights that can help shape the direction of future research and ensure that accounting education remains aligned with the ever-evolving demands of the profession.

# Methods

This study uses bibliometric analysis to examine research trends in accounting and accounting education from 2013 to 2023, combining Publish or Perish for metadata extraction and VOSviewer for network visualization (Al Husaeni & Nandiyanto, 2022; Azizah et al., 2021). A total of 998 articles with 61,349 citations were analyzed, revealing key metrics such as h-index and g-index. VOSviewer identified 131 items in five clusters, with 4,421 links and a link strength of 12,655, highlighting strong collaboration among researchers. This approach uncovers emerging trends, gaps, and future research directions while aligning academic inquiry with industry needs.

# Trends in Accounting and Accounting Education

The bibliometric analysis using Publish or Perish software identified 998 papers in accounting and accounting education from 2013 to 2023, with a total of 61,349 citations and an average of 5,577.18 citations per year. Each paper received an average of 61.35 citations, indicating a strong academic impact. The data shows an average of 2.36 authors per paper,

with individual authors contributing to 535.81 papers and receiving 30,666.95 citations per author.

Key metrics include an h-index of 131 and a g-index of 217, reflecting high productivity and influence within the field. The age-weighted citation rate of 10,340.68 highlights the lasting relevance of many publications. Additional indicators, such as the PoP hI, norm index of 85, hI, annual index of 7.73, and the Fassin hA-index of 44, demonstrate sustained contributions and scholarly influence over time. This data reveals a highly impactful and collaborative research landscape, setting the foundation for deeper exploration of research trends and networks using VOSviewer.

The table below (Table 1) presents the most-cited articles in the field.

	Table 1: Journal	Article Search Results Based on the Most (	Citations	5
Cites	Authors	Title	Year	GSRank
2122	Loughran, T., &	Textual analysis in accounting and finance:	2016	945
	McDonald, B.	A survey		
1381	Gennaioli, N., et al.	Human capital and regional development	2013	914
1206	De Villiers, C., et	Integrated Reporting: Insights, gaps and an	2014	834
	al.	agenda for future research		
1094	Plvia, S., et al.	Online education: Worldwide status,	2018	950
		challenges, trends, and implications		
1063	Bebbington, J., &	Achieving the United Nations Sustainable	2018	554
	Unerman, J.	Development Goals: an enabling role for		
		accounting research		

Meanwhile, the second table highlights the articles with the highest relevance and impact, based on Google Scholar (GS) ranking, reflecting their influence within the academic community.

	10010 = 0000000000000000000000000000000			
Cites	Authors	Title	Year	GSRank
134	Apostolou, B., et al.	Accounting education literature review (2015)	2016	1
173	Apostolou, B., et al.	Accounting education literature review (2016)	2017	2
178	Apostolou, B., et al.	Accounting education literature review (2013–2014)	2015	3
268	Apostolou, B., et al.	Accounting education literature review (2010–2012)	2013	4
147	Rebele, J. E., & Pierre, E. K. S.	Stagnation in accounting education research	2015	5

 Table 2: Journal Article Search Results Based on Google Scholar Rank

And the following is the number of publications by year, and a graph of research developments on this topic.



Figure 1: Trend of This Topic

The bibliometric analysis conducted using Publish or Perish highlights significant fluctuations in research output within the fields of accounting and accounting education over the decade from 2013 to 2023, with a notable peak occurring in 2020. This peak, comprising 145 publications, aligns with the pervasive disruptions caused by the COVID-19 pandemic, which catalyzed substantial shifts in educational practices and priorities. The surge in publications during this period likely reflects an intensified focus on adapting accounting education to remote and digital formats, underscoring the field's responsiveness to external global crises.

Table 1 in the analysis brings attention to highly cited works that concentrate on emerging and critical areas within accounting research, such as textual analysis, integrated reporting, and the pivotal role of accounting in achieving the United Nations Sustainable Development Goals. These topics not only highlight the evolving focus of accounting research towards integrating broader socio-economic objectives but also signify the increasing relevance of accounting practices in addressing global challenges.

Furthermore, Table 2 underscores the foundational impact of studies such as those by Apostolou et al., (2015), whose literature reviews continue to be highly relevant and influential, as evidenced by their rankings in Google Scholar. These works have been instrumental in delineating the trajectory of research and identifying pivotal themes that have shaped scholarly discourse in accounting over the years.

The observed decline in publication numbers in 2022 and 2023 might suggest a realignment of research priorities, possibly due to the stabilization of educational formats post-pandemic or delayed indexing processes. This trend underscores the necessity for continuous monitoring of the research landscape to capture evolving trends, shifts in academic focus, and emerging areas of study. Utilizing tools like VOSviewer for this purpose allows for a more nuanced understanding of the network of collaborations and thematic linkages across studies, providing deeper insights that can guide future research directions and strategies in accounting and accounting education. This ongoing analysis is essential for maintaining the dynamism and relevance of research in adapting to changing educational needs and professional practices in the accounting sector.

#### **Research Connections and Novelty**

The VOSviewer analysis identified five clusters representing key themes in accounting and accounting education. Cluster 1 (red) focuses on education with 130 links, making it the central theme, closely related to study. Cluster 2 (green) emphasizes students with 124 links, reflecting the importance of student engagement. Cluster 3 (blue) covers accounting with 130 links, indicating its core role. Cluster 4 (yellow) focuses on research with 119 links, suggesting a broader yet essential topic. Cluster 5 (purple) addresses analysis with 87 links, showing its role in supporting research outcomes.

	student perf	ormance	
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emorting this educate jo	ournal faculty	pandemic	
integration	course accounting course value mode	learning teacher	
educator focus	approach unive	rsity academic perf	ormance
accounting curriculur review	n auditing teaching ofession benefit ir	student business npact determinantuse shaha	
way		problem effect	
develo sustainability	change	ion factomformation	
big data pra	d world ctice perceptio	effectiveness in performance	
gap	skill curriculum e	vidence abilitylevel	education level
	data accountant	quality	
acco	unting protession auditor	training	

Figure 2: Density Visualization



Figure 3: Network Visualization



Figure 4: Overlay Visualization

The density visualization from the bibliometric analysis provides a comprehensive overview of the evolving landscape in accounting and accounting education research since 2018. The focus has notably shifted towards the practical impacts of accounting education on business practices, pinpointing specific areas such as learning outcomes, performance, and the efficacy of training programs. This shift underscores a growing recognition of the direct influence that educational frameworks have on the professional capabilities of graduates and, by extension, on the business sector itself.

Emerging themes highlighted in the analysis, including quality assurance in education, problem-solving skills, enhancements in university programs, and the evolving roles of accountants, reflect a broadening scope of accounting education research. These areas of focus not only respond to the changing demands of the global business environment but also indicate a move towards more integrated and application-based educational strategies.

The most prominently studied themes, as identified in the analysis education, study, students, accounting education, accounting, and technology demonstrate their enduring significance in research. The persistent emphasis on these topics indicates their foundational role in the field and their continuous evolution in response to technological advancements and shifting educational paradigms.

This analysis reveals not only the current research trajectories but also significant gaps and opportunities for future inquiry. For instance, while there is substantial attention on the integration of technology in accounting education, there may be underexplored areas concerning the specific impacts of emerging technologies like artificial intelligence and blockchain on accounting practices and education. Furthermore, the role of sustainability in accounting education remains a relatively nascent area that could benefit from deeper exploration, especially in light of increasing global emphasis on sustainable business practices.

Encouraging exploration in these underdeveloped areas not only fosters innovation but also ensures that accounting education remains relevant and capable of preparing students for a rapidly changing professional landscape. This synthesis of research connections and novelty offers a clear direction for future studies, urging scholars to venture beyond established boundaries and contribute to the development of novel educational models and methodologies that address both current and future challenges in the accounting profession.

## Conclusion

This bibliometric analysis highlights key trends and developments in accounting and accounting education over the past decade. The findings indicate strong academic impact, with 998 publications and 61,349 citations from 2013 to 2023, driven by topics such as education, student engagement, accounting practices, and digital technologies. VOSviewer identified five clusters, with education as the central theme, closely connected to study, accounting, and analysis, reflecting the field's collaborative nature. Emerging trends since 2018 emphasize the impact of accounting education on business practices, learning outcomes, and training. The analysis also reveals gaps and opportunities for future research, encouraging further innovation and interdisciplinary approaches to address evolving industry demands. These insights provide valuable direction for researchers and educators to align academic efforts with professional needs, fostering continuous improvement in both research and practice.

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#### Mapping Sense of Belonging 'Moments' on University Students' Journey

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#### Abstract

It is widely established that arriving at university can be a confusing and disorientating experience; a world away from sixth form and college. Educators, researchers and policy makers within higher education, are in agreement that developing a sense of belonging is fundamental to students' settling-in, engaging and achieving academic success. This paper examines undergraduates' university journey and their perceptions of university belonging. Three hundred and fifty first year undergraduate students on BA (Hons) business and management at Leeds Business School, part of Leeds Beckett University, participated in a qualitative study to explore students' sense of belonging from their unique perspective. They were asked to upload their own sense of belonging 'moments' through a mixed media digital noticeboard, representing their journey from pre-arrival to the middle of the second semester. It was found that there were opportunities for academic and services staff, and the students themselves, to create belonging moments during this time. The moments fell into three categories; first, moments in classrooms and lecture theatres; secondly moments 'at home' in student accommodation; and finally, moments on nights out, at student societies and during other social activities. In response to the findings, Sense of Belonging Moments are being promoted through fresh interventions, including a new-look induction, a video to signpost services; and student-led tours to promote awareness of campus spaces and facilities.

Keywords: University, Sense of Belonging, Student Experience, Business School, Wellbeing, Higher Education

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#### Introduction

To belong to a community provides individuals with a sense of purpose and affiliation. Maslow, (1962) classifies belonging as a psychological need, second only to food and water. It provides mental and physical health benefits (Pesonen et al., 2015) and its importance in higher education is widely accepted (Crawford et al., 2024). Furthermore, belonging includes feeling valued, accepted, and respected as an individual (Pedler et al., 2020). Akinbode (2022) found relationships, support, identity, listening, and respect to be the most significant factors for a sense of belonging. However, it is essential to understand student perceptions of their own belonging to support their general wellbeing (Miller et al., 2018). Evidence shows that when students have a sense of belonging at university, they achieve greater self-efficacy, contributing to academic success (Luong et al., 2022; Young Ahn & Davies, 2020). This is partly because belonging leads to the attendance, engagement, and the retention of students (Hausmann et al., 2007; Suhlmann et al., 2018).

In connection with Mann, (2001) who likened beginning university to crossing the border into a new country, this paper continues with the metaphor of belonging as a journey rather than a destination. This journey begins with pre-arrival activities such as open days and the offer of a place, through to the induction and welcome activities, continuing to the first lecture, the first assignment, and into the second semester. On transitioning from school and college to this first year at university, students embark on an exciting but often frightening and unprecedented expedition into adult life and grapple with "culture shock" as they need to learn new ways of independent living and learning (Rickard et al., 2018, p. 42). Often, students focus more on survival than academic achievement, and their attainment, progression, and graduate outcomes can be hindered by feelings of alienation (Porteous & Machin, 2018). This has led to high numbers of students dropping out in the first semester and unprecedented numbers reporting mental health concerns (Student Minds, 2023).

The COVID-19 pandemic in 2020 had an adverse effect on belonging by removing opportunities to engage face-to-face and an overnight pivot to remote learning (Luong et al., 2022; Kelly et al., 2024). This seismic event provides ongoing challenges for universities to promote attendance and engagement as students found they could access classes and materials remotely, causing belonging to suffer since (Sutcliffe & Noble, 2022). If, as Gravett and Ajjawi (2022) argue, belonging is a situated practice dependent on physical spaces and buildings previously taken for granted, the removal of these spaces, along with the social engagement within them, presents challenges. However, simultaneously, new possibilities emerged to conceptualise belonging as intangible and as a mindset, creating it in digital space. By adopting a more fluid and intangible approach to belonging, it is possible to continuously experiment with belonging as a practice.

Gravett & Ajjawi, (2022) state that belonging is "situated, fluid and socio-materially constituted" (p. 1393), arguing that due to the massification of higher education, it is necessary to avoid lazy assumptions about the student experience. They argue that the sense of belonging should be continually reassessed by engaging in dialogue with diverse students, such as those from different cultural backgrounds and those with disabilities. "Rather than being static, the affective dimension of belonging is an active process that changes and flexes over time and situations, and in response to one's own subjectivity" (Pesonen et al., 2015, p. 6). Additionally, students can be subtly marginalized if emphasis is placed on achieving belonging for the "typical" undergraduate (Thomas, 2015; Juvonen, 2006). Not all students are full-time, fresh out of school, resident on campus, and eager to participate in a drinking

culture, for example (Thomas, 2015). Furthermore, Gravett & Winston. (2021) argue that some students prefer not to belong, instead envisioning themselves as "outsiders." This may be because they commute from home, are older, or prefer to keep to themselves (Baik et al., 2017). Guyotte et al. (2019) define "un-belonging" as something actively sought by some students who resist belonging because they see it as joining a club to which they do not want to belong. Belonging, therefore, fluctuates in different contexts and is subjectively experienced (Pesonen et al., 2023). Because of this, institutions should move beyond the idea that belonging can be achieved by putting procedures and strategies in place (Slaten et al., 2018). Instead, universities need to constantly listen to and evaluate students' changing needs and adjust their approaches accordingly, which is the aim of the research.

Despite the overall consensus that a sense of belonging in students is beneficial, it is difficult to achieve in diverse and large student populations. This is because it is often experienced differently by students depending on class, race, disability, and gender (Read et al., 2003). Therefore, because of widening participation in higher education, it is necessary to approach belonging with an open mind to explore what it means to specific student cohorts. This is to design interventions that might improve student belonging and reduce attrition rates. This paper aims to address this by exploring belonging on a large and diverse course at Leeds Business School, at Leeds Beckett University (LBU). This research responds to a call by Gravett & Ajjawi (2022) to better understand the "nuanced, situated and contextualised accounts of students' belonging" (p. 1393), both at university and in non-institutional spaces and times. The project aims to gain a deeper understanding of how students feel, think, and behave when it comes to adapting to the challenges of being at university, therefore providing new ideas for staff to facilitate a sense of belonging. The research explores how "sense of belonging" moments emerge, are encouraged, and/or facilitated at different stages of the first year, from pre-arrival to the second semester. This includes "where," "when," "who with," and "how" students feel a sense of belonging, seen through the students' own sensory contributions to a digital Padlet. In agreement with Humphrey & Lowe, (2017), who examine the "journey" to belonging, Wilson et al., (2015) describe starting at university as a process rather than a singular event. Furthermore, as Akinbode, (2022) explains, all universities have different needs depending on their unique student cohort. Therefore, despite the many papers exploring the sense of belonging in higher education, it is essential for institution-level research to be carried out to define the unique needs of their cohort and to regularly revisit this, as their idiosyncrasies evolve over time as all business and management students are not the same. This was the rationale for this study.

#### Leeds Beckett University Context

Leeds Beckett University (LBU) has approximately 28,000 students across two campuses. This study is concerned with Leeds Business School undergraduate core business programmes (BA Business Management and Pathways, BA International Business, and BA Business Studies), which had 1,658 students registered in 2023/24. In recent years, there have been significant changes to the nature of the student body (Giannakis & Bullivant, 2015; Morgan, 2013), and Leeds Business School is no exception. Finn & Holton (2019) reported an increased number of students staying at home while they study, therefore deciding not to join the university community. These changes include an increase in international students, greater numbers of students with reasonable adjustment plans, more first-generation university students, and increasing numbers of students from diverse ethnic and cultural backgrounds (LBU, 2024), which make creating a sense of belonging more challenging.

Progression data from 2020 revealed that only 67% of Level 4 (first year) undergraduate business students progressed to Level 5 at the first sit, with 33% of students having to undertake a resit to progress to the next level (LBU, 2024). In total, only 88% of students progressed or continued with their studies, and while there was significant disruption to learning during the COVID-19 pandemic, these poor progression and continuation rates are not unique to this period (LBU, 2024).

## Methodology

A master plan was compiled, stipulating methods and procedures for the collection and analysis of the information required, giving attention to every specific research question (Babin et al., 2012). Primary research was focused on a Digital Sensory Feedback Inquiry (DSFI) with a theme of inclusivity. The research team made efforts to engage with hard-to-reach, disengaged, or alienated students by implementing a range of measures to make the DSFI accessible and engaging. The inquiry was inspired by the data collection "feedback exhibitions" of Humphrey & Lowe (2017), where several activities were set up for students, requiring only a short amount of time for their contributions.

A digital Padlet was utilised to collect data in a variety of formats. The data collection took place from November 2022 until June 2023. The DSFI employed the probability sampling technique to select participants, also known as simple random sampling (Nikolopoulou, 2022). The sampling frame was generated from the Business in Action module, the most well-attended Level 4 undergraduate module in Leeds Business School, providing access to a large number of students (429) and ensuring participants were from the target population (Saunders et al., 2019). Random sampling ensured every student in this module had an equal chance to contribute to the digital Padlet, reducing bias and increasing the representativeness of the sample (Cochran, 2015).

The DSFIs were designed to be fun and engaging, with the purpose and rationale communicated from the outset, outlining how the project would benefit all students. A digital Padlet was created with headings to represent the student journey. This was designed by students who had volunteered to be part of the sense of belonging research team, meaning it reflected their perspectives on what the journey was, as they were currently experiencing it. The journey began with "pre-arrival," followed by "moving-in," induction, societies, semester one, socializing, first lecture, first assignment, sports, start of semester two, and finally "miscellaneous" to capture everything else.

Under each of these headings, students were encouraged to post digital content, including videos, text, photos, GIFs, audio clips, drawings, or songs. Students were prompted to create new and original content where possible and to approach the topic of their belonging from different perspectives, rather than the most obvious. However, most of the contributions were textual, likely because this was the quickest and easiest way for students to participate.

The appointed student ambassadors, research leads, and academic experience officer were central in designing the DSFI and its communications to capture student interest. The DSFI was promoted by Level Leaders via social media and email before weekly seminars. Tutors provided the digital Padlet link and instructions for participation at the start of each seminar. Level Leaders also contacted all non-attending students to encourage engagement, offering remote participation options for those unable to attend in person.

The methodology took an inductive approach, using qualitative techniques. The DSFI drew from phenomenology, as the project team was not searching for a single truth but investigating multiple realities of students' experiences, perceptions, and the meaning behind these experiences. Phenomenology is defined as "the philosophical tradition that seeks to understand the world through directly experienced phenomena" (Littlejohn & Foss, 2009, p. 558), with emphasis on participants' lived experiences.

Full information about the project was provided to participants, and they were asked to provide consent and confirm they were over the age of 18. Contributions to the research were anonymised, and participants were able to withdraw at any time. Contact information for the research team was provided throughout to ensure participants could ask questions or seek clarification about their data.

Data collection partly took place in the classroom as part of a module; however, the research team clarified that participation was voluntary. Participants were instructed not to include identifiable people without their consent in submissions to the Digital Padlet, and names or identifiable imagery were prohibited to ensure anonymity (Saunders et al., 2019). Obscene content (including imagery, video, text, or audio) was prohibited, and any content violating these rules was excluded from analysis.

The student research team manually analysed Padlet entries, searching for themes and patterns. The Padlet has been made into a video to share across the university and during presentations of the research.

#### Results

There were 560 entries on the Padlet, encompassing various types of data, such as photos, drawings, text, audio, video, and GIFs. These entries came from 350 students, indicating that some students submitted more than one entry.

# **Pre-Arrival**

The majority of responses reflected nervous anticipation about fitting in, making friends, being away from home, and uncertainty regarding what to expect from university and the course. Other responses were positive, expressing excitement about new experiences and independence. Communications from accommodation providers and the availability of an app were reported to ease student concerns. Several students suggested that the university could provide a group chat prior to arrival. However, arriving late was noted as a factor that hindered integration.

Many emotions influence students even before arriving at university. There is potential to alleviate anxiety by providing consistent information before arrival. For instance, students noted that earlier access to their timetable would have been helpful. International students highlighted excitement about experiencing different weather, novel environments, and exploring new places but also mentioned difficulties with VISAs that impacted their sense of belonging. Similarly, students who accepted places via clearing expressed feelings of confusion and overwhelm. Students retaking a year also reported a nervous start.

One student shared mixed feelings about starting university:

"When I was accepted into university, I was excited for my independence and to be able to experience life outside of my hometown. The ability to do whatever I want appealed to me dearly. I'm here, I miss my mother's cooked meals every night. Providing for yourself is not as good as it seems."

## **Student Accommodation**

Many contributions to the Padlet focused on the high cost of student accommodation. Some students expressed stress and negative emotions about moving into their accommodation. Issues included arriving to find flatmates who were in different years and had already developed relationships, which led to feelings of exclusion. Despite this, there were predominantly positive reflections on the experience of moving in, as students found it exciting, felt a sense of independence, and saw opportunities to meet new people and socialise.

Images shared on the Padlet depicted contrasting aspects of student accommodation life, such as dirty dishes on the floor, intoxicated students at parties, and well-decorated bedrooms with fairy lights, curtains, and posters. One student remarked:

"I was excited to design my own room. I was excited for a different sense of independence."

Students also shared their impressions of Leeds as a city, expressing enthusiasm for exploring it. However, students living at home noted feelings of exclusion:

"Living at home means I had a lot less interactions than other students, with other students. People already met new people although it is not a lifestyle of mine to meet new people and go out as other university students do."

# Induction

The induction was considered useful and informative by half of the students, while others found it repetitive and unhelpful. Most students who contributed to this section had attended the induction, and one student commented on its value in helping them clarify their goals:

"I thought the induction was useful with helping me understand where I want to be at the end of my 3 years and also helping me understand more about what was going to be happening in the next years at university."

Conversely, students who were less positive about the induction felt it was too lengthy and noted that they disengaged after a while.

# **First Lecture**

Fear about attending the first lecture was frequently expressed by students on the Padlet. As the *Business in Action* module is held in the university's largest lecture theatre, one student described it as "like the movies." While most students were satisfied with the lecture and found it helpful, some struggled with knowing how to take notes. A few students met new people, though others reported that it was "easy to zone out" due to the lack of interaction and the length of the session.

One student remarked:

"First lecture is scary if you haven't had your seminar yet as you may not know people but it's fine once you have your seminars."

Another student described the experience as isolating:

"A crowd can be lonely."

However, some students highlighted the positive impact of supportive lecturers. As one explained:

"The lecturers were all very welcoming at Leeds Beckett University. I know for some it can seem very daunting, but their warmth and welcomeness helped smooth over stress they might have had, allowing those who may have been a little intimidated by the whole adjustment to easily feel in place."

#### **Start of Semester One**

At the beginning of semester one, students had varied experiences regarding their sense of belonging in lectures and seminars. While many students appreciated the opportunity to make friends, they noted that teaching staff quality varied, with some fostering a sense of belonging more effectively than others. Cancellations caused by staff industrial action and poor weather were highlighted as negative experiences.

One student shared:

"Doing online seminars because of the weather and strikes has not been great because it is nice to be with people in the seminar."

Another student, who faced commuting challenges, noted:

"It's tough when you live in a different city and commute."

#### First Assignment

Most students reflected positively on their first assignment, with many finding it manageable. However, referencing and using digital tools like Turnitin proved confusing for some. Group work also presented challenges. Students appreciated assignment support and feedback and recognised that university work required a different approach compared to college or sixth form.

One student recounted their success:

"My first assignment went well. I used everything I was taught and included it into the presentation. Overall, my group was given good feedback, and also given recommendations on how to improve on future assessments."

Conversely, another student described a less positive experience:

"My first assessment did not go so well. I received 35%, resulting in a fail. This was an eye-opener for me and made me place more importance on my studies and again realize that it's all down to me, as in sixth form college you are chased after and guided through the whole process. On resit, I passed after I had fixed up my study routine and learnt content."

This student's experience underscores the adjustment required when transitioning from college to university.

#### Semester Two

The start of semester two was disrupted by industrial action and train strikes, which students reported as significant annoyances. These disruptions, coupled with poor weather, hindered some students' ability to settle back into university life. One student commented:

"I feel more used to university life and have settled in now. I like most of the content of my modules."

Another expressed improved preparation:

"I think this was the best semester as I was more prepared for the classwork and assessment."

However, students who had not formed friendships in semester one reported difficulties in making connections as friendship groups had already become established. Students also noted an increase in workload and stress as the semester progressed.

#### Societies

Students who participated in societies, including sports, games, cultural, and outdoor activities, generally viewed them positively, citing their value in meeting new people and having fun. However, some students felt there were no suitable societies for them or were deterred by membership fees.

One student shared:

"Societies are a great way to enjoy and meet new people. There are different types of societies for people with all kinds of interests."

#### **Sports**

Participation in sports, especially team sports, was praised for helping students make friends and offering a break from academics. However, some students noted that sports activities held on other campuses were inconveniently located, and communication about sports teams could be improved.

One student recounted their experience:

"The social netball team was really fun, and I have made many of my uni friends there. It was lovely to take a break from academics and put my energy into playing sports for a few hours every week. The atmosphere was inviting, and everyone was lovely."

Another shared their pride in representing the university:

"Joining the cheerleading team was a great way for me to make friends from different courses and to unwind from university work. Competing with my university also gave me a lot of pride in representing them and gave me a sense of belonging."

Many students explained that they found it hard to make friends because the only people they meet are in the seminar group. Students who commuted to university found this especially hard. Those staying in university accommodation seemed to find socialising occurred more easily. The World Cup, Pride, and a student union concert were cited as occasions when students socialised a lot and made friends. The university was found to be quite empty when teaching finishes, and this would affect students not living in halls. The student union bar was cited as a good place to socialise, as were sports and societies.

"I am a mature student and find it very difficult to meet people with similar interests, seminar groups can be shockingly small and to make it worse you are stuck in the same group all year! For instance, my group in some seminars had 3 people attending some days and on average was less than 7. I have heard talks that lectures will be online next year; I doubt that will help my sense of belonging."

In summary, the Padlet presented a mixture of feelings related to belonging. First, moments in classrooms and lecture theatres; second, moments "at home" in student accommodation; and finally, moments on nights out, at student societies, and during other social activities. The Padlet highlights the journey of students starting at university, amidst a cocktail of excitement and anxiety. Themes that stand out are making friends, adapting to a new environment, and absorbing new ways of doing things. Like other journeys, there are factors that improve the journey, like getting support and having friends. Other things occur unexpectedly to knock the journey off course, like weather and industrial action. Students' maturity and resilience are decisive factors in whether they will survive the journey.

#### **New Interventions**

From the findings of the study, several new interventions are being actioned. These include a more fun and social induction for making friends, condensed timetables, level leaders to be students' main pastoral support, a workshop and digital resource for staff development, getting students study-ready in their home country, providing access to laptops, and English language support. We continue to talk to and listen to students to get their input on belonging, including as a consultancy project at Level 6. These activities are in their early stages and will be measured to assess their success.

# Conclusion

The current project aimed to investigate students' sense of belonging at Leeds Business School in order to design interventions that might improve student belonging and therefore reduce attrition rates. The research was successful in achieving this aim, and as a result, several new initiatives have been created, such as a new-look induction, a video to signpost services, and student-led tours to promote awareness of campus spaces and facilities. It was important for the research to provide a practical output, and with this in mind, six "Moments of Belonging" have been developed and disseminated in a practical workshop to academic staff and student services to encourage an institution-wide belongingness mindset.

In agreement with van Herpen et al., (2020), it was found that on coming to university, students embarked on a "journey." From pre-arrival to the middle of the second semester, and encapsulating study, socialising, university, "home," and "out," there were opportunities for academic and services staff, and the students themselves, to create sense-of-belonging moments. These fell into three categories: first, moments in classrooms and lecture theatres; second, moments "at home" in student accommodation; and finally, moments on nights out, at student societies, and during other social activities.

The findings have been disseminated at the University's Developing Excellent Academic Practice (DEAP) Conference and the Sense of Belonging Moments delivered as a workshop to LBU School of Built Environment and Computer Science. This could have a wide-reaching benefit on the university's overall attainment, progression, and outcomes. The initial exploration described in this paper just begins to scratch the surface as the UK HE sector investigates students' "sense of belonging" as a means to tackle retention and enhance the student experience. Although small-scale, this study has illuminated some factors that will support the university in understanding influences on students and the times at which a "sense of belonging" is most likely to be developed or is of most importance.

# Limitations

The limitations to the research include that it is qualitative and focuses on one particular course at one university. Whilst it identifies aspects of students' sense of belonging, it was not possible to grasp the statistics of particular issues such as commuting, caring, or disability. Entries on the Padlet were anonymous, so it was also impossible to make connections to particular circumstances or demographics, such as any link between commuting and ethnicity, unless explicitly mentioned. It is impossible to measure if there is an improvement to student outcomes since our interventions, but this will be measured in time. A future study will involve longitudinal research with the same group through second and third years to identify how belonging evolves. Despite encouraging all students to contribute, the students who are disengaged were less likely to take part, so we were only able to capture the feedback of students who were engaged, which may skew the results. Echoing Gravett & Ajjawi (2022), some students don't want to belong and may prefer alternative connections outside the university. It is yet to be ascertained how these students can be supported.

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# Mediating Effect of Metacognitive Awareness on the Sense of Efficacy of Pre-service Educators

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#### Abstract

The pre-service educator preparation period is crucial in developing the competencies for highly effective educators who succeed in the classroom. In this regard, pre-service educators' metacognitive awareness and sense of efficacy beliefs about their profession remain critical determinants of their success in teaching. Developing pre-service educators' metacognitive awareness can promote their sense of efficacy when faced with challenges in their future profession. This presentation reports on part of a larger quantitative study on the relationship between metacognitive awareness, teaching perspectives, and sense of efficacy of pre-service educators. The aim of this presentation is therefore to investigate the mediating effect of metacognitive awareness on the sense of efficacy of pre-service educators. The study adopted a quantitative research approach, underpinned by post-positivism paradigm. A sample of 683 pre-service educators completed the Metacognitive Awareness Inventory for Teachers (MAIT) and the Teachers' Sense of Efficacy Scale (TSES. The Social Packages for the Social Sciences (SPSS) was used to analyze data. The correlation between the latent variables was examined using structural equation modelling (SEM). The results of the study indicate a significant correlation between the variables of metacognitive awareness and sense of efficacy. This suggests that the results from individual profiles on the MAIT and TSES could inform pre-service educators about their underlying teaching assumptions, consequently, this could improve their teaching practices.

Keywords: Metacognitive Awareness, Sense of Efficacy, Structural Equation Modelling, Preservice Educators

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# Introduction

Pre-service education plays a crucial role in the education system. The purpose of the study was to investigate the mediating effect of metacognitive awareness on the sense of efficacy of pre-service educators. Metacognitive awareness enables educators to reflect on their thinking processes, while a strong sense of efficacy supports confidence in their teaching abilities. Metacognitive awareness and educators' sense of efficacy beliefs plays a major role in the teaching and learning process. Therefore, encouraging pre-service educators to develop metacognitive skills is essential for fostering these beliefs, equipping them to create successful learning environments and thrive in professional practice. To ensure that students to engage in activities that will enhance their metacognitive awareness and foster a sense of efficacy beliefs. Therefore, it is important to encourage pre-service educators to practice metacognitive skills, this will prepare them for the work environment.

#### Metacognitive Awareness

The conceptualisation of metacognition is popularly attributed to the 1970s pioneering work of John Flavell (1979). This conceptualization suggests that metacognition involves the ability to regulate cognitive processes during learning. Metacognition is understood to be a process of encoding information, organizing it, and then selecting the information needed by scanning it and then controlling that information in the memory (Flavell, 1979). Hence, Özçakmak et al. (2021) indicate that metacognition is a higher order cognitive ability because it evolves in relation to an individual's self-knowledge and abilities in learning how to learn. Meanwhile, metacognitive awareness refers to the individuals' awareness of their own learning strategies and how and when to successfully apply them (Harrison & Vallin, 2018). Therefore, metacognitive awareness reveals what one knows about his own cognition (Özçakmak et al., 2021). In its simplest sense, cognitive awareness is an individual's awareness of his own thinking styles and knowing how to acquire systematic thinking skills.

Metacognition as a construct consist of two main elements: Knowledge of cognition and regulation of cognition (Schraw & Dennison, 1994; Kallio *et al.*, 2018). Knowledge of cognition (the extent to which the learner knows), includes declarative, procedural, and conditional knowledge of cognition (Sperling et al., 2002). *Declarative knowledge* refers to how individuals learn and what influences their performance, *procedural knowledge* refers to the different strategies and procedures that can be used to solve problems, and *conditional knowledge* refers to when and how to use these strategies. *Regulation of cognition* refers to one's ability to plan, implement, monitor, and evaluate learning processes (Schraw & Dennison, 1994). Planning relates to the process of activating prior knowledge, setting goals, and selecting appropriate strategies, monitoring relates to the process of checking how well the learning processes and strategies used are, and evaluation relates to the process which involves reflecting on the outcomes of the learning processes.

#### Sense of Efficacy

In the 1970s, Albert Bandura, a scholar of social cognition theories, first defined the concept of sense of efficacy as the "conviction that one can successfully execute the behaviour required to produce certain outcomes" Bandura (1997, p. 193). This conceptualization underscores the idea that individuals are unlikely to to engage in challenging tasks unless they possess a belief in their ability to achieve desired outcomes. In essence, sense of efficacy
pertains to the beliefs individuals hold about their capacity to perform specific tasks. Within the domain of teaching, the construct of sense of efficacy is further refined to refer to educators' "beliefs in their capabilities to perform specific teaching tasks at a specific level of quality in a specific situation" Dellinger et al. (2008, p. 752). This definition emphasizes the fact that sense of efficacy beliefs is context specific, suggesting that they are limited by the demands of tasks or environments. Consequently, individuals may exhibit varying levels of efficacy across different tasks or situational contexts.

Tschannen-Moran and Hoy (2001) proposed a framework of sense of efficacy in teaching comprising the following three core dimensions of sense of efficacy: sense of efficacy in student engagement (SE-SE), sense of efficacy in instructional strategies (SE-IS), and sense of efficacy in classroom management (SE-CM). Studies that have focussed on educators' sense of efficacy have defined SE as beliefs related to educators' effectiveness in students engagement, instructional strategies, and classroom management (Hoy & Spero, 2005; Tsouloupas et al., 2010; Cocca & Cocca, 2022).

Sense of efficacy in Student Engagement addresses educators' "beliefs about the emotional and cognitive support they can give their students and about their ability to motivate student learning" (Ainley & Carstens, 2018, p. 51).

Sense of efficacy in Instructional Strategies refers to educators' "beliefs as to whether or not they can use alternative teaching practices, assessment strategies, and explanations" (Ainley & Carstens, 2018, p. 51).

Sense of efficacy in Classroom Management refers to educators' "beliefs about their ability to establish an orderly learning environment and, therefore, effectively manage disruptive student behaviour" (Ainley & Carstens, 2018, p. 51).

# **Empirical Investigation**

The study utilised the post-positivism paradigm and a quantitative research approach. The population for the study entailed pre-service educators who had registered for a Bachelor of Education degree in the Foundation Phase, Senior Phase, and the Further Education and Training Phase. Data was collected through a close ended online questionnaire, the metacognitive Awareness Inventory for Teachers (MAIT) and the Teachers' Sense of Efficacy Scale.

The Metacognitive Awareness Inventory for Teachers Balcikanli (2011) consists of 24 items divided into six subscales: declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and evaluating. Each one of the 24 items is scored on an agree-disagree scale (Strongly agree, Agree, Neutral, Disagree, and Strongly disagree). The table below depicts the inter-item correlation means and the Cronbach Alpha values of the MAIT.

Variable	Perspective	Inter-item correlation means	Cronbach Alpha
	Declarative knowledge	0,304	0,636
Metacognitive Knowledge	Procedural knowledge	0,317	0,645
	Conditional knowledge	0,291	0,620
Mataaamitiya	Planning	0,329	0,654
regulation	Monitoring	0,319	0,651
regulation	Evaluation	0,363	0,694

Table 1: Summary of Inter-item Correlation Means, and the Cronbach	Alpha	Values for
the Metacognitive Awareness for Teachers Inventory		

The results presented in Table 1 above illustrate that the inter-item correlation means for metacognitive knowledge ranges between 0,291 and 0,317, whilst the inter-item correlation means for metacognitive regulation ranges between 0,319 and 0,363. Meanwhile, the overall inter-item correlation means for MAIT items ranges between 0,291 and 0,363. This suggests that the items for the metacognitive awareness inventory are well correlated and can be used for further analysis. The Cronbach Alpha reliabilities for MAIT are as follows, 0,620 – 0,645 (metacognitive knowledge) and 0,651 – 0,694 (metacognitive regulation). The overall Cronbach's Alpha ranges between 0,620 (metacognitive knowledge-conditional and 0,694 (metacognitive regulation-evaluation), indicating Cronbach Alpha values equal to 0,70. According to Gil-Gómez et al. (2017), this implies a high level of consistency of the inventory.

Teachers' Sense of Efficacy Scale was developed by (Tschannen-Moran & Hoy, 2007). The long version of TSES has 24 items, whilst the short version has 12 items. For this study, the short (12-item version) was used to collect data. The two versions represent three distinct, but related factors associated with teaching: Student Engagement, Instructional Strategies, and Classroom Management. Each of the items is scored on a rating scale, ranging from1 (Not at all), 2 (Very little), 3 (Somewhat), 4 (Quite a bit), and 5 (A great deal). The table below depicts the inter-item correlation means and the Cronbach Alpha values of the TSES.

Perspective	Inter-item correlation means	Cronbach Alpha	
Student Engagement	0,389	0,695	
Instructional Strategies	0,477	0,783	
Classroom Management	0,438	0,756	

Table 2: Summary of Inter-item Correlation Means, and the Cronbach Alpha Values for the Sense of Efficacy Scale

The results presented in the above table show the inter-item correlation means of 0,389 for student engagement, 0,477 for instructional strategies, and 0,438 for classroom management. The overall inter-item correlation means for TSES ranges between 0,389 and 0,477. This indicates that the items for the sense of efficacy scale are well correlated and can be used for further analysis. The TSES's Cronbach's Alpha reliabilities are as follows: 0,695 (student engagement); 0,783 (instructional strategies); and 0,756 (classroom management), indicating

Cronbach Alpha values greater than 0,70. According to Gil-Gómez et al. (2017), this implies a high level of consistency of the scale.

#### Results

To examine the relationship between the latent variables of metacognitive awareness and educators' sense of efficacy, the SEM was used. The following model (Figure 1) which is obtained from SEM, depicts the relationship between these latent variables.



Figure 1: Structural Equation Model of Metacognitive Awareness and Sense of Efficacy Developed at One University in South Africa

The model focuses on the relationship between metacognitive awareness and educators' sense of efficacy. In this model each of the latent variables – metacognitive awareness and sense of efficacy are symbolised by ellipses (ovals). The manifest (observed) variables appear in the rectangles. Metacognitive awareness has two observed variables (Knowledge and Regulation) and sense of efficacy has three observed variables (Student Engagement, Instructional Strategies, and Classroom Management). According to Morrison et al. (2017), the relationships between the latent variables can be conceptualized as covariances, direct effects, or indirect (mediated) effects. According to Figure 1, there is a directional relationship between metacognitive awareness and sense of efficacy. This direct relationship is symbolised by a single-headed arrow. The straight arrow between MA and SE illustrates a weak prediction of (0.222) at the p<0.05, suggesting that MA weakly predicts SE. In their studies, Aurah (2014) and Sümen and Çalişir (2016) also have indicated a positive relationship between metacognitive awareness and educators' sense of efficacy.

# **Correlations Between the Constructs of Metacognitive Awareness and Sense of Efficacy**

In total, sense of efficacy total has a positive moderate correlation with metacognitive awareness total (r=0.432; p<0.01).

	Variables	Metacognitive knowledge	Metacognitive regulation
ſ	SE_SE	0.289**	0.308**
	SE_IS	0.389**	0.360**
F	SE_CM	0.395**	0.355**
	SE Total	0.410**	0.385**

The results presented in Table 3 confirm that there is a significant correlation between the variables of metacognitive awareness and educators' sense of efficacy.

#### Conclusion

The results of the study indicate a significant correlation between the variables of metacognitive awareness and educators' sense of efficacy. This suggests that results from individual profiles on the MAIT and TSES, could reliably inform pre-service educators about their underlying teaching assumptions, of which they may not be aware. This may, in turn, improve their teaching practices.

The study was limited to one public University in South Africa. Respondents were recruited in 2022, just after COVID-19, and classes were conducted online. The researcher used stratified purposeful sampling which was convenient for the context and times of the pandemic. The fact that data collection was carried out during online mode of delivery suggests that there is a possibility that during face-to-face teaching, responses could be different.

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#### The Concept of Educational Equity: A Study of Brazilian Scientific Production

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#### Abstract

The "Observatório de Equidade Educacional: da pesquisa à inovação (Educational Equity Observatory: from research to innovation)" carries out an investigation into the construction of the concept of educational equity. This digital platform evaluates, monitors and tracks public data on Brazilian education, a proposal linked to the Center for Excellence in Social Technologies, the Psychology Institute of the Federal University of Alagoas, in partnership with the Ministry of Education and Culture of the Brazilian government. This study deals with Brazilian academic production on the concept of educational equity, with the following questions as triggers: How has Brazilian conceptual production of equity taken place in terms of historical and social development? What is the relationship between the concepts of equity, gender, race, ethnicity, social class and socioeconomic status, considering the Brazilian educational reality? We used meta-synthesis (exploration, cross-referencing, refinement, description and interpretation) with data from the Portal de Periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior. The descriptors "education" and "equity" were used, with mandatory presence in the title of articles published between 2000 and 2022. The results of 29 articles, after applying the filters, indicates the concept of equity as a guiding principle for public policies in various educational areas, such as mathematics education, physical education, inclusion of people with disabilities and educational policies during the Covid-19 pandemic. A relationship is observed between educational equity and gender, race, ethnicity, social class and socioeconomic status, considering the Brazilian educational reality. The synthesis relates equity to justice, based on UNESCO definitions.

Keywords: Basic Education, Educational Equity, Intersectionalities

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### Introduction

This study discusses the academic Brazilian production about the concept of educational equity. It is part of a project called: "Observatório de Equidade Educacional (Educational Equity Observatory)" TED 11970, MEC/SEB/NEES-UFAL, with the support of the Education Ministry (MEC) by the Secretary of Basic Education, in partnership with the Center for Excellence in Social Technologies (NEES) from the Federal University of Alagoas (UFAL).

It presents the following trigger questions: How has Brazilian conceptual production of equity taken place in terms of historical and social development?; What is the relationship between the concepts of equity and gender, race, ethnicity, social class and socioeconomic status, considering the Brazilian educational reality?

The trigger questions of this study refer to the use of the term equity in the educational field. In this sense, we turn to the studies produced by the research group Epistemology and Psychological Science (CNPq/Ufal) about the production of concepts.

In view of this, it is essential to highlight that the United Nation Educational, Scientific and Cultural Organization (Unesco) and the Ministry of Education have been producing researches that aim to improve the Brazilian educational quality and equity. Considering that, it is pointed out that these studies provide indicators capable of contributing in the evaluating process of educational quality and equity.

Therefore, educational equity is a central topic to a national and international policy. However, it is necessary to understand the concept, the ways how its concept is used and possibilities of developing indicators that might contribute to public management. Below, it is presented the methodological path used in this research.

#### **Data Production and Analysis Procedures**

In this research, it utilized articles as the analytical *corpus*. The data are from the platform Portal de Periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) (Brasil, 2024) and the database Google Scholar-Scielo. The descriptors "education" and "equity" were used, with mandatory presence in the title of articles published between 2000 and 2022. As described on the website, Portal de Periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), this database is one of the more expand and vast Brazilian scientific collection and this platform is responsible for gathering and turn available national material, besides other materials signed by international editors and teaching and research institutions in Brazil (Brasil, 2020).

In addition, it stands out that the material available corresponds to millions of scientific periodicals of complete texts, hundreds of these materials are diverse, such as, articles, references, audiovisual material, technical standards, dissertations, theses, among others (Brasil, 2020).

The search for articles was made with the following descriptors: "education" and "equity", with the mandatory presence in the title of the published articles between the years 2000 and 2022. This study was carried out between May 2023 and January 2024. A meta-synthesis was used. The study from Cavalcante & Oliveira (2020, p. 85) affirms that a meta-synthesis aims

to characterize and identify specificities from different kinds of bibliographic reviews. About this, the authors highlight the capacity of a meta-synthesis to produce a critical and interpretive review on qualitative studies (Cavalcante & Oliveira, 2020, p. 97).

According to Cavalcante & Oliveira (2020), the meta-synthesis has five stages: 1) Exploration: in this stage, it is necessary the definition and use of descriptors to select the study in database; 2) Refinement: corresponds to data treatment stage with the definition of inclusion and exclusion criteria to improve selection of studies; 3) Cross-referencing: in this stage, it is carried out a comparative analysis between selected data previously aiming to approach the chosen topic in historical and social terms; 4) Description: corresponds to the detailed description of the theory, methods and results obtained with the selected data; 5) Interpretation: this stage aims to carry out an interpretative synthesis, looking for similarities, contradictions and innovation on the selected data.

The initial result was 33 articles from the Google Scholar-Scielo database and 58 from Portal de Periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES). CAPES. After the three first stages, 29 articles were obtained.

Emphasizes that twenty of the twenty nine articles analyzed were published in co-authorship. There is a diversity of periodics and subjects approached in the researches, especially in higher education. The 29 analyzed articles were produced by 67 authors - women and men - and distributed in 28 periodics, mostly in education and social sciences areas.

#### The Concept of Educational Equity

From the analyzed material, it is observed studies that associate equity to justice, based on the views of the author John Rawls expressed in his Theory of Justice. Costa & Soares (2015, p.172) affirms that John Rawls became the main author in this discussion because of the Theory of Justice, published in 1971. The main topic discussed by the author is how to discuss the relationship between equity and justice, also giving due attention to each specificity of modern societies, these peculiarities unravel conflicts connected to social, economics and political inequalities.

In addition to that, Costa & Soares (2015, p. 127) reaffirm Rawl's contributions as they expose how the author reformulated the concept and, consequently, put this concept in the justice field to be used as a way to mediate conflicts from groups that are part of a democratic society. Costa & Soares (2015) also emphasize the equity constitutes a principle. The goal is not to guarantee parity to the developing standards, but ensure that the minimum is assured.

The interpretation indicates the concept of equity as a guiding principle for public policies in various educational areas, such as: Mathematics Education (Silva, 2016, Santana *et al.*, 2022); Physical Education (Beltrami, 2000, Baptista & Baptista, 2017); Inclusion of people with disabilities and educational policies during the Covid-19 pandemic (Regis & Kabengele, 2018, Araújo, 2020, Garcia e Michels, 2021).

The study of Silva (2016) is called Equity and Mathematics Education. It was published in the journal Mathematics Education Research. As its goal, the study aims to make evident the main topics and contradictions related to this concept (Silva, 2016, p. 400). This study adopts John Rawl's concept of justice as equity.

Silva (2016) affirms that the meaning of equity is justice and not equality. The author also emphasizes that, according to Rawls, the theory of justice as equity deals with the inequalities from the point of view of the citizens, in other words, their perspectives are considered throughout all their lives. There are, basically, three contingencies able to affect this point of view: the original social class, natural talents and bad or good luck throughout life (Silva, 2016. p. 414).

Santana *et al* (2022) published a study called Northeast Mathematics Education Network: Professional Development and Statistics Teaching on a Critical and Equity Perspective, on the Brazilian Journal of Science Teaching and Technology (RBCET). It had as an objective to present the planning of teaching to be developed in Math classes involving local and global elements linked to the Covid-19 pandemic. In this sense, Santana *et al.* (2022) affirm that the term equity appears related to justice and equality.

Beltrami (2000) published a study that also understands equity as a principle, coming from the idea of social justice, albeit a fallacious one that has been turned into a trap by the World Bank's proposal. According to Beltrami (2000, p.154), if physical education is an activity that helps to preserve the individual bodies of anu age, sex and social condition, it is an ethical obligation to ensure that the less privileged have the right of access physical education just as much they are ensured to have water to satisfy their biological needs.

Therefore, age, sex and social conditions become elements that constitute an idea of equity, in the sense that the author understands as a right of every and each person, specially, the ones in social and economic disadvantages, developing actions that help preserve the body heritage (Beltrami, 2000).

Baptista & Baptista (2017) published a study called Physical fitness test in physical education: justice as equity in the right to education. Also adopting the justice concept of John Rawls. This research aimed to reflect about the legitimacy and limitations of the requirement needed in specific skills tests for students to enter higher education courses in Physical Education, raising questions about justice and the right to access education (Baptista & Baptista, 2017, p. 205).

The authors affirms, based on the Rawls theory (2000), the justice as equity in the higher education grounds on the moment that would exist equity in opportunities and permanence of all students that would wish and had condition to study in the higher education (Baptista & Baptista, 2017, p. 207).

The study of Regis & Kabengele (2018) entitled, "The person with disabilities and access to education: a policy for equity, published in Perspective in Dialogue: Journal of Education and Society", aimed to verify the possibility to promote social inclusion of people with disabilities by having access to education. The authors defined equity in the public policies field.

Araújo's (2020) study entitled Inclusion and Equity in Educational Opportunities: the deaf students in the context of inclusive education, published in the Journal of Education, Arts and Inclusion (REAI), presents reflection on the inclusion of deaf students in mainstream schools. The main goal of the study was to realize a critical and reflexive analysis about the inclusion of deaf students in a mainstream school from the perspective of a deaf student (Araújo, 2020,

p. 218). According to the author, inclusion and equity are correlated. Equity is understood as an opportunity of learning.

The study of Garcia & Michels (2021) called Education and Inclusion: equity and learning as capital strategies. The authors comprehend equity as a principle affirming that they discussed international guidelines of educational policies between 1990 and 2020 and analyzed three different generations of Brazilian special education policies, related to the education and inclusion of education and equity and learning strategies (Garcia & Michels, 2021, p.1). It is pointed out that equity appears as a guideline for policies and educational practices. Therefore, the authors base their reflections on equity considering Unesco's contributions.

In a nutshell, considering the limitations from the search criteria used in this presented research, it is emphasized that this contributions to the constructions of a concept initiated by indicating the relationship between equity and socioeconomic, gender and racial conditions of the students marking the necessity of not take it tacitly, but relate it to concrete actions of social transformation.

# Conclusion

The production of this meta-synthesis enabled the conceptual understanding of educational equity in terms of historical and social development. This study seeks to contribute in the process of bringing educational analysis and public policies closer, especially considering the diversity of conceptual aspects discussed, as well as the production and data analysis used in the studies.

It is observed that the authors point to the equity theme in the abstract and goals of the articles. The discussions about equity make an interlocution to Social Sciences, Human Sciences, Applied Social Sciences, besides getting closer to the area of Health. As for the objectives of the studies, most of the productions explicitly state what they intend to approach throughout the articles.

About the studies related to Education, most of the researches involved discussions related to equity and higher education. As it was pointed out earlier, there are studies that approach the concept of equity defined as a regulatory principle and articulate the concepts of quality and equity, as well as the tensions between equality and equity.

In view of this, it was noted that from 2002 onwards, the researches focused on the construction of equity as a evaluating phenomenon. Thus, it is emphasized two perspectives already presents in Beltrami (2000) and that perpetuate in the concept discussion during all the time period analyzed: the relationship between the term equity and factors such as gender, race, socioeconomic level and school effectiveness, adding the idea of opportunity equality and educational quality as synonym of equity.

The interpretative synthesis indicates a relationship is observed between educational equity and gender, race, ethnicity, social class and socioeconomic status, considering the Brazilian educational reality. As for the production of the concept of educational equity over the period analyzed, the ideas of John Rawls and his Theory of Justice are prominent.

About the documents used also to discuss the concept of equity, it is highlighted international productions: UNESCO Guidelines, documents from the World Bank and the ABC of Women

Worker's Rights and Gender Equality da International Labour Organization It is worth noticing that there are studies based on the definition of equity as a regulatory principle of justice, present on the UNESCO Guide, developed in 2019.

In this sense, Soares, Santos & Lopes (2020) affirm that equity should guarantee a vision leading to justice and fair processes, considering the promotion of an actually inclusive e equality equity (Soares, Santos & Lopes, 2020, p. 2). It is expected to collaborate to advance academic-scientific production, aiming to encourage the production of new studies about the debated theme and possible improvements in the fight for an inclusive society.

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# Educational Equity in the State and Municipal Education Plans of Northeastern Brazilian States: A Documentary Analysis

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#### Abstract

This study deals with themes related to brazilian government policies with focus on basic education. It aimed to analyze the term educational equity in the State and Municipal Education Plans of Brazilian Northeastern States and their respective capitals. This is a documentary study. Three stages were carried out: 1) searches on official websites of the nine Secretariats of Education, Legislative Assemblies and City Councils of the state governments and municipalities of the nine northeastern states and their respective capitals, with the aim to identify the state education plans of the states (PEE) and the municipal education plans (PME) of the Brazilian northeast capitals; 2) identification of the term equity in these documents; 3) preparation of electronic spreadsheets recording the findings of the searches carried out. It was observed that: all the states and municipal plans (capitals) in the northeast of the country are available on websites; the term equity was used in all the plans, but they do not present or propose a conceptualization of the term; the National Education Plan is a model for the PEEs and PMEs. It is concluded that in the documents analyzed, the term equity is associated with: guaranteeing equal access to and permanence in school and providing equal use of physical structures; raising the level of teacher training for all schools and raising the level of education, with priority for social groups and the socially and historically vulnerable population.

Keywords: Educational Equity, Education Plans, Document Analysis

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### Introduction

It analyzed the Brazilian governmental actions in the education area. This study is part of the research project titled "Observatório da equidade educacional: da pesquisa à inovação" (Educational Equity Observatory: from research to innovation) TED 11970, MEC/SEB/NEES-UFAL, linked to the Ministério da Educação - MEC (Education Ministry), through the Secretária de Educação Básica (Secretary of Basic Education), in partnership with the Núcleo de Excelência em Tecnologias Sociais - NEES (Center of Excellence in Social Technologies) from the Universidade Federal de Alagoas (Federal University of Alagoas).

It seeks to analyze Brazilian public policies focused on Basic Education, involving educational equity and intersectionalities. The analysis strategies emphasized on the official documents: Educational States Plans (PEE) Municipal Education Plans (PME) of the Brazilian Northeast states and its respective capitals.

It was observed a concern a *priori* to the educational equity through intersectional issues.

In this sense, it highlights the educational equity, intersectionality and education plans as an efficiency instrument in public policies.

On educational policies, it is considered the concept of educational equity related directly to the idea of inclusion. To the United Nations Educational, Scientific and Cultural Organization - Unesco (2019) inclusion is a result from continued work to identify and overcome limitations to the presence, participation and achievements of students. It is added as equity to the constant effort on pursuing justice in education relationships. This is translated on the attention and effort to guarantee that education is considered to be of equal importance to all students. Inclusion and equity, therefore, are overarching principles that must guide the elaboration of policies, plans and educational practices.

In the discussion about intersectionality is fundamental that is established as a priority the proposition of educational policies. It is a form of putting a lens on oppression dynamics and erasing of social vulnerable groups; it is not only the sum of characteristics that compose one's subjectivity (Crenshaw, 2002). In this way, paying attention to the intersectional aspects of the relations allows one to capture the structural consequences of subordination processes of people and/or social groups due to its own existence condition.

In this intersection between equity and intersectionality, it is urgent to establish articulation to understand differences markers of opportunity in Brazilian education. These markers are congeneric expressions that involve the most diverse social categories, such as race, gender, social class, age, among others (Henning, 2015), exposed to oppressive and discriminatory barriers fed by a capitalist logic. An intersectional analysis of educational policies can reveal the relationship between different levels of educational management in Brazil and, more importantly, how they materialize into norms in each territory.

# **Legal Foundations**

There is a series of legal documents that guide specific public policies elaboration related to education, putting equity as its foundation and object of actions to be proposed. At a more general level, paving the way for the educational reform process is the Brazilian Magna Carta

(Brasil, 1988), specifically Art. 205 to Art. 214 as they established goals and guidelines to Brazilian basic education. Although it does not refer to the word equity, it brings with it a central idea for the discussion raised here: equal conditions and opportunities for all as a guiding principle of the entire Brazilian educational system.

As a way of regulating what the Constitution of the Federative Republic of Brazil (Constituição da República Federativa do Brasil) on the mentioned articles - the Law 9.394, from december 20 of 1996 (Brasil, 1996) and the Law 14.113 from december 25 of 2020 (Brasil, 2020) -, which establishes Guideline and Foundations of National Education (Diretrizes e Bases da Educação Nacional - LDBN) and creates the Development and Maintenance Fund of Basic Education and the Education Professional Valorization (Fundo de Manutenção e Desenvolvimento da Educação Básica e de Valorização dos Profissionais da Educação) respectively, present itself as issues that might be considered as equity indicators. We have, as examples, equal conditions to access and permanency at school, guarantee of quality standards; consideration of ethnic-racial diversity and respect to the human diversity, and the use of resources by students that favor those in socially and economically disadvantaged conditions.

# **Education Plans as a Public Policy to Promote Educational Equity**

The education plans emerge within the scope of legal documents. They do, however, in a more operational way, since they establish goals to be achieved and practical strategies whose implementation makes it possible to achieve them.

The National Education Plan (PNE) is a result of a joint effort by educational thinkers and public administrators that refers to 1931. After the elaboration of precursor documents, the first PNE is approved in 1962 and, from there, it starts being mandatory and continuous, but with a definite duration as a way of enabling it to be evaluated and reworked. It also becomes part of developing national plans. The current PNE refers to the years 2020-2024 and was established by Law 13.005 on June 25 of 2014. Its approval has a ripple effect over Federal District, States and cities, since determinantes to federated entities the education plans elaboration, which attend to predefined strategies in PNE (Brasil, 2024).

The education plans are, therefore, an educational planning instrument. They seek to guide the implementation and improvement of public policies. They are constituted by specific legislation in all levels and established in a hierarchical form: the municipal plans are elaborated based on state plans, which for its part, are based on the National Education Plan (PNE). Because of their strong operational appeal, they are structured in goals and these in strategies, converting in an important way of evaluating national educational policies.

The educational equity is a central aspect, in the previous cycle of the National Education Plan (PNE 2014-2024), and also it will be in the new PNE cycle that initiates closely. Although, the guiding documents don't explore or describe how the school management bodies, in their own locations and territories, should approach the promotion of equity. Therefore, this gap is investigated. The present study analyzes the promotion of equity present, materially, in guiding educational documents of Brazilian states and cities.

# Methodological Procedures Adopted

The methodology characterizes documentary research, which, unlike bibliographical research, is concerned with the search of official documents, books, newspapers, letters, movies, reports, among others. In other words, material that didn't receive any scientific treatment (Sá-Silva et al., 2009).

It had as an analysis object, the States and Munipals Education Plans from the Brazilian Northeast states and its respectives capitals, main initial target of the research, which will expand to other Brazilian regions. The elaboration of education plans by states and municipalities arise from the guidelines approved on PNE (National Education Plan) to the period from 2014 to 2024 upon the Law 13.0005/2014 (Brasil, 2014).

Three principal stages were carried out: 1) the search on official electronic sites from the nine Education Secretaries (Secretarias de Educação), Legislative Assembly (Assembleias Legislativas) and Councillor's Chamber (Câmaras de Vereadores) from the states and cities of the nine Northeastern state and its respective capitals, with the goal to identify the municipal education plans from Northeastern capitals and state education plans from Northeastern states; 2) identification, on these documentos, of the following descriptors: equity, gender, person with disability, poor/poverty, ethnic-racial, quilombola, indigenous; 3) elaboration of electronic worksheets of terms on the documents, besides the identification about the context in which the term equity is used.

#### **Results and Discussion**

The results indicate that the official documents are available in a public form and of easy access. However, the education plans, both state and municipal, from eighteen analyzed plans, in eleven - four cities and seven States - don't present a diagnostic document, studies and analysis that give foundation the establishment of goals and strategies, in other words, it wasn't available on electronic pages where its respective education plans were found, nor placed as part of PEE and PME.

Regarding content and form, all state and municipal plans that were analyzed comply with what is required by the PNE, in the sense to meet with foreseen guidelines, goals and strategies, as determined by the Art. 8. It is observed that the PNE is a mode to the most of PEE and PME, establishing twenty goals in the same order defined on PNE. Three municipalities and four states are exceptions. They comply with the norm of approach topics covered by the national plan, but establish a different amount of goals, also arranged in their own order.

All plans analyzed use the term Equity, either in the diagnosis on which the law and plan were based, in the law establishing the education plan, in the set of goals and strategies or in all three documents. However, none of the documents, plans and diagnosis, present or suggest a conceptualization for the term. There is, to a certain extent, a tacit use.

Occurs, nevertheless, an indirect conceptualization, once the word equity is used both as a way of qualifying the goals of the plans and as a regulatory/indicator principle of the quality of the goals set. In a general way, the term Equity designs to the application of public resources on education, in other words, equity as a standard that impacts directly the access and permanency at school and the equal use of physical structures; subsidizes strategies that

assure educational equity to determined social groups as to guarantee learning equity, primarily, to social groups and population historically vulnerable; and to raise the training level of teaching staff to all schools.

These intentions, reflected in the goals and strategies of each plan, act as indicators of how equity should be manifested in educational policies from States and cities. Thus, it has a positive impact on vulnerable populations, social groups and communities and their intersectionalities.

It was with this perspective that it was searched, on the plans, the occurrence of terms that could contribute to the formulation of an overview on intersectional issues. It was conceived that the presence of words gender, disability, poor, ethnic-racial, quilombola and indigenous, within the scope of the idea of gender relations, attention to the poorest people, ethnic-racial relations and structural and pedagogical procedures guided to specific population groups, would indicate a link *a priori* to public policies with educational equity.

All defined terms are present on the analyzed documents. Disabilities, indigenous, quilombola and ethnic-racial are identified more often, possibly related to the direct reference to these groups in the current National Education Plan (PNE). Besides that, the logic behind the analysis, in this article, explains this profusion: in education plans, equity is translated on the referred actions to the groups and populations historically vulnerable. It is necessary to verify, also, a possible relationship with social mobilization in favor of these issues. In general terms, denote intersectional aspects in public politics, which reinforce the necessary qualification or explanation to a more precise comprehension of what is meant by equity.

#### Conclusion

At last, we considered that the analyzed plans present, in discursive terms, intention, albeit tacit, in the search for educational equity on strengthening actions from education and a general overview favorable to the amplification of the importance of intersectionalities on the process of formulating public policies. Nevertheless, important intersectionalities such as poverty and gender receive less attention.

From the method point of view, the research proved to be a strong tool in the comprehension process from which are the priorities materialized by the public policies register. It also enabled a broad identification of context and meaning of the terms on Education Plans available on governamental sites, what can be considered an important tool on the monitoring of Brazilian educational policies. It emphasizes the importance of activities developed by the Educational Equity Observatory.

To a certain extent, the fact that part of the federative bodies (seven States and three municipalities) don't present the diagnosis document that grounds the elaborated education plan, gives the impression that the demand and need of these plans result directly and exclusively from a legal determination: art. 214 from the Federal Constitution (Brasil, 1988) and from the National Education Plan (PNE), by the Law 13.005 of June 25 from 2014 (Brasil, 2014) and not from an intentional, critical and plural reading of the social context. This situation limited the analysis to understand at which level the educational plans are compatible with the local reality to justify the goals and strategies, or if seek to meet the established parameters as an end in itself.

The research continues with the amplification of analysis, by interviews with public managers, with the purpose to verify the strengthening of intersectionality as a attention object in the formulation of this public policy in Brazilian international education.

The existence of education plans, all the effort taken and public structure mobilized to its elaboration, open a vast field of citizen participation to be taken up by different actors in a perspective of a political opportunity (Abers et al., 2018).

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#### Insights Into Student Self-Assessment Within Interdisciplinary Project-Based Learning

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#### Abstract

The literature indicates that university programs often lack opportunities for interdisciplinary project-based learning, essential for developing new skills, including professional ones (Reverdy, 2013). Reflective practice has been proven to be a valuable method for enhancing learners' awareness of their abilities (Denami & Adinda, 2023), enabling them to regulate their own learning (Bandura, 1991). This study explores learners' learning experiences in a Hackathon, a project-based learning activity, within an interdisciplinary framework. Master students from two different study fields worked together on a real project. Our method involved providing a reflective form to help them identify various aspects of their learning, such as competencies and learning situations. Lexical analysis software was then used to analyze their answers. Results indicated that on the first day (T1), participants identified five main topics demonstrating their competencies: work values related to interdisciplinary settings, collaborative work, project management, public speaking, and debating skills. These same topics reappeared on the second day (T2), with more accurate use of vocabulary related to project management and the interdisciplinary context they experience. Decision-making skills also emerged as an additional topic. Despite the benefits of interdisciplinary collaboration, learners experienced stress due to limited understanding of their peers' academic cultures. However, their reflections revealed the value of such collaboration. Addressing these challenges and targeting successful crisis management skills requires indeed an innovative pedagogical approach. The findings of this study emphasized the necessity of transcending traditional lectures to more innovative pedagogical approaches fostering competencies needed by their prospective professional environments.

Keywords: Project-Based Learning, Interdisciplinary Setting, Hackathon, Professional Skills Acquisition

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#### Introduction

Universities today undergo significant transformations in multiple dimensions, particularly pedagogy and organization. Since implementing the Bologna Process, higher education institutions have been increasingly tasked with aligning their curricula to meet the evolving demands of socio-economic partners. This alignment aims to enhance the professionalization of university students and better equip them with the competencies required by the labor market (European Commission, 2022). These changes are not merely administrative but touch upon the core of teaching practices, with a growing emphasis on fostering skills that bridge academic knowledge and professional application.

Our contribution focuses on exploring one such pedagogical approach: the "hackathon" method, implemented within interdisciplinary contexts. Hackathons are time-bound, collaborative events where students work together to solve real-world problems, combining skills from diverse fields such as technology, business, and design. This approach encourages creativity, problem-solving, and teamwork, essential competencies for the modern workforce Through this research, we aim to provide interdisciplinary learning environments that favor students' capacity to tackle complex, real-world problems while preparing them for careers that increasingly demand both specialized knowledge and broader, cross-disciplinary skills. Consequently, this study aims to identify the competencies that students develop in an interdisciplinary project-based learning activity, embodied in a hackathon, and to highlight whether the competencies present are those targeted by the activity and critical for both professional and academic success, such as communication, adaptability, and collaboration. To achieve its objective, the study first reviews the literature focusing on project-based learning, learners' professionalization through Hackathon, and interdisciplinarity in learning. Then, the data collection protocol, which emphasizes using reflective forms to help learners identify various aspects of their learning, was implemented. The article concludes with a presentation of the results and a discussion of the key conclusions drawn from the study.

#### Literature Review

#### Project-Based Learning and Learners' Professionalization Through Hakcathon

While hackathons are generally organized as corporate events designed to rethink work practices and situations, it is interesting to study their implementation in the academic context, as they provide an environment conducive to the acquisition of methodological and professional skills. The word hackathon combines two words: "hacker" and "marathon" (Komssi et al., 2015), and takes the notion of playful ingenuity and integrates it with a context of intense concentration and limited time (Brennan et al., 2014). A hackathon can be defined as a digital innovation competition taking place over a short period (Adinda et al., 2024). The effectiveness of this environment relies, in particular, on the motivation and involvement of participants and on the fact that the participants have something to share to bring out a dynamic of reflection around a problem posed (Gréselle-Zaïbet et al., 2018) to identify a solution or define a potential project to carry on in response. The hackathon format plans to bring together, for 12 to 48 hours, professionals from a variety of backgrounds (interdisciplinary dimension) in an attempt to "collaboratively and openly provide original and practical solutions, generally of a technological nature, to problems that then remained unresolved. Today, this approach even tends to extend to socio-technical or organizational solutions, such as the design of new processes (Dionne & Carlile, 2016).

French universities are constantly called to innovate to support research and learners' success, both at university and in their future professional lives. Indeed, professionalization has become a major issue for higher education (Rose, 2018). On this subject, the issue most often put forward is that of matching the demand of professional circles with training in professional, specialized, and disciplinary skills. Furthermore, over the past decade, the craze for transversal skills (Santelmann, 2019), essentially social skills or soft skills (Morlaix, 2015), has also broadened the scope of professionalization. Consequently, professional skills training schemes have been set up at universities since the first years of the bachelor's degree, with the most prevalent formats which include professional context and undergo training during their academic year. However, it is the host organization that bears the responsibility for the development of learners' professional skills acquisition, while the university's role is to equip them with conceptual and theoretical knowledge (Coulon, 1997).

Project-based learning is an experiential learning approach (Kolb, 1984) based on a constructivist paradigm. Recently reintroduced to higher education, this approach allows learners to engage in active exploration of their environment, seek solutions to their problems, and carry out a project. Krajcik & Shin (2014) noted that this approach also enables learners to gain a deeper understanding of the subject learned when they actively construct their knowledge by understanding the needs of the projects and working on them. The socio-constructivist dimension of this method also allows individuals to benefit from support from their peer group through social interactions and the establishment of collective intelligence, thus facilitating both the realization of the project and the co-construction of knowledge. For those unaccustomed to this learning approach, notably, when implemented through a Hackathon, the experience enables them to progress in a zone of proximal development (ZPD), thereby facilitating the broadening of their skills.

Several studies have already demonstrated the effectiveness of this approach, which encourages greater participation in educational activities and improves various dimensions of learning. Kaldi et al. (2011) observed that learners who had engaged in project-based learning exhibited enhanced outcomes in both content knowledge and group work skills. This study also highlighted a significant aspect of learning: learners' intrinsic motivation and positive attitudes towards peers were also developed as a result of teaching project-based learning. Other studies (Boaler, 1998; Karaçalli & Korur, 2014) observed that project-based learning had significant effects on learners in terms of academic success and knowledge retention. Indeed, project-based learning is known to improve conceptual understanding, often requiring creative and in-depth thinking, in contrast to the procedural knowledge acquired by the traditional teaching group, which relies mainly on information recall. Stewart (2007) observed a positive influence of project-based learning on preparation for autonomous learning. His study highlighted that learners who experienced project-based learning developed high levels of self-direction skills and were able to achieve significant results in terms of learning scholarly knowledge. This phenomenon can be explained by the fact that project-based learning enables learners to identify the meaning of their learning activities, which are more akin to social activities, promoting a shift from pure knowledge to more meaningful, "global" and cross-disciplinary learning (Weber, 1982). To sum up, the current literature agrees that participatory learning enables the development of disciplinary and crossdisciplinary or transferable or soft skills and competencies and is in some way linked to the phenomenon of professionalization.

#### Interdisciplinarity and Learning

Interdisciplinary learning is an effective response to the challenge of training university students, the citizens of the future, to deal with various societal challenges. If we think, for example, of the challenges of climate change, health, and justice, we can only agree on the importance of approaching these issues imperatively from a holistic point of view that goes beyond "disciplinary" technicality if the solution envisaged is to be viable (Boix-Mansilla, 2017; Nikitina, 2005; Slakmon & Schwarz, 2019). Interdisciplinarity as a pedagogical approach, unlike the project-based learning approach, has not yet been sufficiently studied (Markaiskeite et al, 2024) due, among other things, to the difficulty of being able to design and create adequate learning spaces. The implementation of the approach is a considerable challenge, and consequently, research on this subject remains relatively underexplored.

Interdisciplinarity refers to any form of collaboration between disciplines in different spheres integrating research, academia, community, industrial, political, or private life contexts (Markaiskeite et al., 2024). As a pedagogical approach, like many others, interdisciplinary learning has its origins in ancient Greece (Klein, 1990, 2006). At that time, reference was made to a taxonomy of domains and knowledge to be found within science. Nevertheless, the concept of interdisciplinary learning took hold at the end of the 19th and beginning of the 20th centuries: when university research and education had become more specialized and compartmentalized, this approach proposed a posture of openness in contrast, therefore, to this compartmentalization, which was developing a "technicality" that was not functional to societal needs.

In 2002, Ivanitskaya et al. conducted a literature review highlighting the benefits of a particular educational approach based on various scientific studies. According to these authors, this approach promotes flexible thinking, helps individuals recognize the strengths and weaknesses of different disciplines, and enhances the ability to assess the value of acquired knowledge. The benefits also include improved reflective capacity, cognitive skills, content retention, and proactive thinking. Consequently, it also fosters creativity, critical thinking, and the ability to connect disparate ideas. Additionally, this approach helps individuals develop greater tolerance for ambiguity, increase sensitivity to ethical issues, have a balance between subjective and objective thinking, and enhance awareness of biases (Field, Lee, & Field, 1994, cited in Ivanitskaya et al., 2002). While there have been a few pioneering empirical studies (Kidron & Kali, 2015, 2024; Shen et al., 2015; Tytler et al., 2021), research into interdisciplinary learning remains underdeveloped in the context of higher education.

The objective of this contribution is to conduct a study that identifies the types of competencies facilitated by and within this interdisciplinary learning approach. To achieve this objective this study aims to identify the competencies that students develop in an interdisciplinary project-based learning activity, embodied in a hackathon, and highlight whether the competencies present are those targeted by the activity and critical for both professional and academic success, such as communication, adaptability, and collaboration.

# Methods

### Participants of the Study

The study involved forty-three students from three different master's programs in two fields of study. Two groups of participants come from two music education programs at two higher education institutions in France are enrolled in the music education program, preparing them for the secondary school teaching exam in France (Group A; N:10), and are in the instrumental or vocal pedagogy program (Group B; N:10). As for group C (N:23), learners in this group are in an educational sciences program focusing on socio-educational actions, at a university in France.

To collect data on learners' experience of the hackathon, we designed a Reflective form that allowed students, individually and anonymously, to express themselves on the following dimensions:

- Competencies developed or used during the event
- learning experience in various learning situations
- Crisis or problem encountered
- How the crises or problems encountered were resolved

This work focused on the competencies developed or used during the event.

# Instruments for Data Collection and Analysis Method

Given the total number of learners involved and the complexity of the subject, we adopted a qualitative approach, allowing the target audience to describe their experience and skills using an anonymous written reflective form in which open-ended questions are proposed to them on the first and second (and last) day of the Hackathon (Figure 1). Reflective practice has been proven to be a valuable method for enhancing learners' awareness of their abilities and learning (Denami & Adinda, 2023) enabling them to self-regulate their learning (Bandura, 1991). However, while it's true that the answers provided in the reflective form are self-declared, the anonymity of the questions helps to limit bias. To analyze the responses to the reflective forms longitudinally, we asked the students to choose a pseudonym to fill in on the form during the two data collection phases.



Figure 1: Study Protocol

To ensure the objectivity of the findings, while identifying competencies declared on the reflective form, a hierarchical top-down classification analysis administered in Iramuteq

software was carried out. Using the algorithm developed by Max Reinert (1987), this analysis identifies groups of words (lexicons) often found together in the data studied. The software provides a representation of the classification results in the form of a tree structure or dendrogram in which the most characteristic words of each class are identified. In this study, we also managed to do a correlation test between the competencies and participants' profiles using the software (Table 1).

Administered test in Iramuteq	Variable studied
Hierarchical top-down classification analysis	Competencies identified on the reflective form (T1 and T2)
Correlation test	Competencies and participants' profiles

#### Results

The results indicate that on the first day of the event (T1), participants highlighted different topics to describe competencies they used or developed during the day, which included their project management skills (class 3, class 10), collaborative working skills (class 2), communication skills (class 4, class 5, class 8), social relations (class 6, class 9) and their experience in discovering interdisciplinary setting of their team members, as well as their knowledge of the work values related to working in interdisciplinary setting (class 1, class 7).

If we focused on the most significant topics that represent at least 10% of the text, the dendrogram highlighted (Figure 2):

- Work value (class 1)
- Collaborative working skills (class 2)
- Project management skills (class 3)
- Public speaking (class 4)
- Debating skill (class 8)

According to the participants' profiles, the correlation test administered pointed out that group A perceived that on the first day of the hackathon, they developed and used project management skills and public speaking skills. Students in group B identified public speaking skills and debating skills as the competencies they developed and used during the first day of the event. Students in group C highlighted collaborative working skills as one of the competencies they will develop and use during the first day of the event. They also pointed out the topic of work values as important as they work in an interdisciplinary environment (Figure 3).



Figure 2: Competencies Identified on the Reflective Form (T1)



Figure 3: Competencies Identified on the Reflective Form (T1)

These similar topics were mentioned on the last day of the event (T2), with more accurate use of vocabulary related to project management and the interdisciplinary context they are in. If we focused on the most significant topics that represent at least 10% of the text, the dendrogram highlighted (Figure 4):

- Team and project management (class 6)
- Critical thinking and prioritization (class 7)
- Decision-making (class 9)
- Public speaking (class 4)

Those are the skills that specified the project management topic. The topics related to the interdisciplinary learning experience that students have, as well as their knowledge of the work values, are now split into various smaller classes:

- Work value (class 5)
- Communicate synthetically (class 8)
- Future discussion subject or project perspectives (class 10)

If in the beginning, when students highlighted their experience in an interdisciplinary setting, they described it as a discovery (class 7; T1), now on the last day of the hackathon, they are able to identify various discussion subjects or project perspectives (class 10; T2) and thus describe their broadened knowledge of interdisciplinary topics.

According to participants' profiles, the correlation test administered pointed out that group A perceived that on the last day of the hackathon, they developed and used public speaking and decision-making skills. For students in group B, their answers are more correlated to small classes, in which they talk more about role assignment, self-esteem, and work value when they are asked to identify the competencies used or developed. While for students in group C highlighted project management and critical thinking as well as prioritization, as competencies they developed and used during the event (Figure 5).



Figure 4: Competencies Identified on the Reflective Form (T2)



Figure 5: Competencies Identified on the Reflective Form (T2)

#### Conclusion

The results showed that each group of learners developed and used different competencies but tended to use and develop a more defined competence at the end of the event. These are indeed the competencies that the Hackathon was designed to target.

Table 2 below highlighted that group A perceived that on the first day of the Hackathon, they developed and used project management skills and public speaking skills. However, on the last day of the event, their answers add more precision to the project management skills by including decision-making skills in the list. As for learners in group B, they identified public speaking and debating skills as the competencies they developed and used during the first day of the event. On the last day of the event, the answers of group B are more related to small classes. They also talk more about role attribution, self-esteem, and working value when they are asked to identify the competencies used or developed. Finally, the learners of group C, at the beginning of the event, highlighted working on collaborative skills as one of the competencies they will develop and use. They also pointed out the topic of work values as important as they work in an interdisciplinary environment. Their answers on the last day of the event also provide more details about working on collaborative skills, stating that project management and critical thinking, as well as prioritization, are the competencies they will develop and use during the event.

Time 1	Time 2
Group A	Group A
Project management skills (class 3)	Public speaking (class 4)
Public speaking (class 4)	Decision-making (class 9)
Group B	Group B
Public speaking (class 4)	Role assignment (class 2)
Debating skills (class 8)	Self-esteem (class 3)
	Work value (class 5)
Group C	Group C
Work in collaboration (class 2)	Project management (class 6)
Work values (class 1)	Critical thinking and prioritization (class 7)

Table 2: Comparison of Competencies Developed Between T1 and T2

Interdisciplinary project-based learning is relatively rare in higher education Therefore, when we looked at the transcripts of the learners' answers to our reflection form, it was noticeable that they also faced crises related to project quality, misunderstandings in communication, and group work dynamics due to their lack of knowledge about the academic culture of students from different fields and their expectations within interdisciplinary teams. They were also stressed, not only by their project responsibilities but also by uncertainties about their role and expertise within the group. Overcoming these challenges requires clear communication. This involves public speaking skills, mutual respect that can be reached by knowing and having a shared working value, and a supportive environment. To better understand learners' experiences, Future studies will explore their learning experiences across various learning situations (formal, informal, semi-formal learning), focusing on the crises or challenges they encounter, and the strategies employed to resolve them.

Although the analysis of crises presented in this paper is very limited and not the primary objective of this study, the result of this work shows that interdisciplinarity encourages learners to develop attitudes of benevolence, open-mindedness, and readiness to collaborate,

and to work in a team. Those are also competencies targeted by the activity and useful for both professional and academic success. This study also shows that through structured activities designed to support these competencies, students gain the emotional resilience to face academic challenges, the communication skills to bridge diverse disciplinary perspectives, and their capability to constantly reassess their competencies and ensure their continuous improvement in relation to those of their teammates and the project. This process is fundamental in preparing students for answering the demands of their future professional environments. Consequently, this study, ensuring the alignment between university curricula and the demand of the labor market (European Commission, 2012), emphasized the necessity of transcending traditional lectures to more innovative pedagogical approaches fostering competencies needed by their prospective professional environments.

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### The Importance of Practice in Pre-service Teachers' Development: An Analysis From Zone of Proximal Teacher Development (ZPTD) Perspective

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### Abstract

Currently the importance of teacher training emerges as a central theme in Brazilian educational scenario. With the aim of understanding one of the vertices that make up the complex kaleidoscope of a teacher's training path, this research presents the impact of teaching practices throughout two undergraduate courses - in Languages/Literature and Mathematics. To accomplish this goal, a questionnaire answered by the forementioned courses graduates was developed, generating data used to analyze the professional development process of the pre-service teachers in accordance with the notion of Zone of Proximal Teacher Development. This concept was developed from Vygotsky's Zone of Proximal Development (ZPD), which states that the construction of a future teacher takes place in and through interaction – emerging concretely in the performance of the pre-service teachers in their practical activities. In a qualitative analysis of the data – questionnaires and self-assessments on practices' reports - discursive elements that indicate linguistic clues were observed, allowing us to infer how teaching practices contributed to the development of the participants' teaching. The main results pointed out specific differences and similarities in teacher training in each area; however, it is indisputable that teaching practices and supervised internships are of central importance in the training of teachers in both courses. Future perspectives aim to contribute to the improvement of undergraduate teaching courses, with the intention of effectively impacting the qualifications of future teachers.

Keywords: Teacher Training, Pre-service Teachers, Teaching Practices, ZPD, ZPTD

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### Introduction

Many teachers, especially those working in the state public education system, report difficulties in their classroom practices due to having received an initial education that was inconsistent with the challenges they face on a daily basis, as highlighted in studies by Drey (2008) and Carnin (2015). This means that teacher training programs have not been able to satisfactorily achieve their primary goal: to train educators who can teach efficiently. This scenario leds to the importance of improvement on teacher training graduation courses. An overview of teacher training in Brazil and Latin America (Gatti, 2019) can be highlighted through four main issues. 1) teacher training graduation courses are cheaper and can also be taken totally online in some private institutions, making them more accessible to students who cannot afford other bachelor's degrees, thereby serving as a possibility or opportunity of access to higher education; 2) students who choose teacher training courses usually come from poor social, educational, cultural, financial background, which means the worst students usually become teachers – as they do not have enough conditions in all the forementioned aspects to rise to higher education; consequently 3) teaching is not a goal, as they are only pursuing a graduation degree. Finally, 4) teaching training courses usually offer few practical activities, only in the end of the course.

According to the LDB<sup>1</sup> (Brasil, 1996), it is essential that teacher education programs integrate both theoretical and practical dimensions in their pedagogical projects. In the same vein, the National Education Council (CNE) also points out the disconnection between theory and practice as one of the main issues to be addressed in initial teacher training programs, clearly emphasizing the need for students to bridge technical knowledge with classroom practice. For this reason, Resolution CNE<sup>2</sup>/CP No. 7, dated September 27, 2018, established the requirement of 800 hours of practical experience throughout the teacher training courses (divided into at least 400 hours of internships and 400 hours of practice, distributed across various curricular components from the start of the program). In this context, practice is understood as a fundamental curricular component in teacher education programs, particularly during periods of teaching observation and reflection on the teaching process and all related elements. However, it is in the moment of entering the classroom that future teachers reveal their greatest challenges in the process of "becoming" a teacher. This occurs, more specifically, during the courses on Methodology and Language Teaching Laboratory, as well as during the Supervised Internships—when pre-service teachers (graduation students) are required to design and implement teaching projects, taking into account the translation of theory into practice and the school reality in which they will be placed. What was observed, although, is that student teachers face difficulties in associating, relating, and applying theoretical content when developing their teaching practices. Regardless, simply completing an internship does not guarantee the adequate training of future teachers. A critical reflection on the practice experienced is necessary so that the intern can identify the strengths and weaknesses of their teaching, in order to find ways to improve it. In this perspective, the analysis of internship reports becomes a valuable tool for evaluating the development of the future teacher's training.

Based on these issues, the main objective of this study is to understand how a graduation student (or a pre-service teacher) becomes a teacher in a teacher training course and what the

<sup>&</sup>lt;sup>1</sup> This refers to Brazil's national education law (Lei de Diretrizes e Bases), which outlines the principles, guidelines, and regulations for the country's education system. It is often abbreviated as *LDB*.

<sup>&</sup>lt;sup>2</sup> Abbreviation of Conselho Nacional de Educação (National Education Council), which is the body responsible for formulating and advising on educational policies in Brazil.

role of this course is. More especifically, it aims to analyze the perceptions of pre-service teachers regarding the impact of practical teaching activities during the graduation course on their development as educators, examining the importance of this process in shaping future autonomous teachers who can act as didactic engineers of their own lessons, and consequently, become teachers capable of providing effective, high-quality education in their professional careers.

The study took place at IFRS Campus Osorio, a federal held technical institution that offers technical, undergraduation and graduation courses, including teacher training in Languages (Arts) and Mathematics – in which this research was developed. It is located in the northeastern coast of Rio Grande do Sul state. Data analyzed in this study consisted in questionnaires and self-assessment reports of newly graduated teachers.

The contrast amid the theoretical assumptions presented and the data from the questionnaires helped us to understand some aspects of the teacher education and professional development of these graduates, their critical reflection on their own teaching practices, and the value they place on classroom experience. In this way, it was feasable to observe which elements are essential for teaching, such as the construction of teaching knowledge throughout their training in undergraduate programs. Additionally, it was sought to understand how they perceive pedagogical practice, how they apply the knowledge acquired at university, and, for example, how they carry out lesson planning or choose their teaching methodologies.

### **Theoretical Frame**

In the context of this project, the perspective of constructing a future teacher based on Vygotsky's idea that human development occurs through interaction and within it was adopted. This is a concept that is concretely reflected in the actions of the research participants in their practical activities. This analysis was already initiated in previous projects, with some preliminary results published in Drey et al. (2019); however, after conducting the four previous research projects, a framework of linguistic-discursive elements that will allow us to conduct a more concrete and enlightening analysis was designed.

One of the most prominent aspects of Vygotsky's theory is the concept of ZPD (Zone of Proximal Development), which better specifies the interrelation between instruction and development, and the importance of all human maturation achievements for the constitution of the individual (Vygotsky, 2007; 2005). Vygotsky believed that human development has two levels: the first is the level of actual development (ZRD – Zone of Real Development), which encompasses the set of activities the individual can solve on their own. This level indicates the cycles of development that are already complete, referring to the psychological functions the individual has already built up to a certain point. The second level is that of potential development: a set of activities that the individual cannot accomplish alone but can solve with the help of someone and/or instruments that provide proper guidance (a more experienced peer, for example). For Vygotsky (1988), the potential development level highlights development itself more than the actual development level, because the latter refers to already completed development cycles, which belong to the past, while the potential development level points to the individual's future development. Thus, Vygotsky (1988) defined the difference between what a human can solve independently and what they can solve with the help of a more experienced peer as the Zone of Proximal Development, which represents the gap within ZRD (the real development, what has already been achieved,

learner's actual capacities) and a proximal set of knowledge and skills that they can reach through expert-other mediation.

This concept highlights the personal and collective dimensions of the development of teacher professional competence, an issue that continues to be prominent in the works of Mark K. Warford (2011). While Vygotsky introduced the concept of the Zone of Proximal Development (ZPD) pursuing to investigate human development itself, Warford (2011) went further and brought the concept of ZPTD, the Zone of Proximal Teacher Development, seeking to understand how teacher development occurs. Warford (op.cit.) found that during initial teacher training, pre-service teachers were only taught direct concepts, leading to the repetition of actions and simulation of knowledge transferred from their teachers to their later classroom practice. The previous experiences of pre-service teachers were not given space for exposure and discussion during the course, resulting in a gap between academia (theory) and the field (practice).

In this regard, teacher development occurs in four levels that represent dynamic stages. The first (Level I), self-assistance, considers the prior reflections of the pre-service teacher and his/her own assistance when doing their practical activities; the second (Level II), expert-other assistance, highlights the importance of mentoring by a supervisor or more experienced peer (other teachers and classmates) through seminars and exchanging experiences; the third (Level III) reveals the importance of the internalization of Levels I and II, since the preservice teacher has the opportunity of reframing his/her teaching practices after assistances. Finally, the fourth level (Level IV), named recursion, allows the pre-service teacher to review their practice and identify issues to be developed and improved, through repeated application of pedagogical concepts learned in the former stages.

The role of ZPTD in the comprehension of the professional development is to provide an understanding of the complex kaleidoscope of professional development of teachers.

### **Methodological Procedures**

This research is characterized as action research, widely used in the educational field, not only because it facilitates an investigation between educational theories and practices, but also because it is designed as a form of participatory and collaborative research, pursuing the improvement of these practices (Kemmis, 1997). Participants were 20 newly graduates in Languages and Mathematics teacher training graduation courses. The data corpus consists of two distinct sets of data: questionnaires on the importance of teaching practices during the undergraduate program; and self-assessments from the final reports of the supervised practice internships.

### Data Analyses Methodology

The textual-discursive approach of Machado and Bronckart (2009) was used to identify the discursive strategies used by the graduates. This content-analysis method looks for linguistic traits that represent the participants perspective in a specific topic – in this case, a reflection of their practices during the teacher training course.

This approach is carried out at different categories of analysis, which can be perceived in a text and are divided into Organizational, Enunciation, and Semantic Levels. It is important to

understand that the analysis of each category is not performed in isolation, but rather in correlation with the others.

In the organizational level, specific vocabulary related to classroom, schools, institutions and teaching practices can be depicted. The analysis of the enunciacion level focuses on the mechanisms of enunciative accountability, indicated by markers of person, spatial deictics, and place, as well as obligations, values, opinions, rules of the social world (institutional prescriptions), and the insertion of voices and modalizers of the utterance. This category unfolds subjective responsibility mainly through linguistic traits known as *modalizers*, as they modify the meaning of the content. They can be classified in four types:

- Epistemic/logic: they show a degree of truth or certainty about what is said (i.e. *I* should do..., *I may do...*).
- Deontic: when statements are supported by the common values, opinions and rules of the social world, marked by expressions such as *I must*, *I have an obligation*, *I mustn't*, *I can't*.
- Pragmatic: expressed mainly by verbs such as *wanting, trying to know, intending*, etc. They present an interpretation of subjective aspects of action, including not only what is done by the worker, but also what he tries to do and cannot, that is, the impediments and desires that, in fact, were not fulfilled.
- Opinion: they consist of expressions that present the speaker's own evaluation of what is said.

The analysis of the semantic level, or the level related to the semiology of action, examines the judgments related to the thematic object, the modes of action involved in the tasks developed, which activities take place on the individual level (motives, intentions, capacities), and which occur collectively (external determinants, goals, tools), as well as the responsibility attributed to the action.

### **Results and Discussion**

### Questionnaires

Linguistic clues in the questionnaires pointed out different perspectives of teaching to the pre-service teachers of each graduation course. According to the textual-discursive methodology of Machado & Bronckart (2009), in the organizational level there are significant differences. Vocabulary on the utterances reveal Languages students conceive theory and practice as intrinsic, remarking the importance of different methodologies for teaching; while Math graduates mention theory as one aspect, and practice as other aspect.

In the enunciation level, regarding the analysis of the graduates in Languages, there was a high occurrence of epistemic modalizers (which represent the degree of certainty in the actor's perception), reflecting on teaching, as well as on the connection between theory and practice and how to be effective in this integration in the classroom. They also expressed concern about the impact of good theory on their future teaching practice, and how to convey technical content to students in a meaningful way. For the graduates of this program, the concept of teaching is formed through the combination of theory and practice. Among Mathematics graduates, there was a high incidence of deontic modalizers (which indicate institutional prescriptions, obligations, and rules of teaching in the social world); and pragmatic ones, reflecting the singular plan of action, where the graduates used the third person singular and presented a narrative focused on their individual actions as teachers.

Additionally, they were concerned with the gap between what is learned at university and the reality of the classroom, what they need to have and/or know to work in the public education system, and the meaning of what they learned during their undergraduate studies in their actual teaching practice. Thus, the concept of teaching constructed by these graduates emphasizes technical-disciplinary knowledge, where technical (mathematical) knowledge is seen as essential for effective practice.

The findings on the former levels (organizational and enunciative) state the results regarding the semantic level. Languages graduates highlight the importance of assistance, advising and scaffolding in building their professional skills, meaning a collective point of view. Math graduates, however, take into consideration their own abilities/experiences from their self-feedback, which underlies a singular perspective.

### Reports

As forementioned on the questionnaires analyses, linguistic clues in the reports also brought up different profiles of teachers according to their courses. While Languages graduates consolidate their professional skills on reflections based on collective constructions along their practices; Math graduates keep a self-distance from the practices, as if they were "isolated" from the contents. Also, their reports present reflections and feedback on external factors, apart from their actions. They mention the supervisor at school, student's bad behavior in the class, lack of a decent infrastructure at schools, but not their own responsibility or participation in this process.

### Conclusion

The analyzed data depict some aspects of the profile of graduates from the two programs and some of their particularities. Mathematics graduates appear to be more focused on technical content, while among Languages graduates the integration of theory and practice emerges more strongly. These observations suggest that teacher training graduates may carry certain intrinsic characteristics from the courses they attended, which end up arising in their professional practice. They acquire not only the specific knowledge of the subject they teach, but also absorb a teaching awareness settled in their training institution. This awareness includes an understanding of pedagogical principles, teaching methodologies, and assessment strategies. These analyses point out that Languages graduates can integrate more easily the 4 levels of ZPTD – probably because the course promotes assorted opportunities of reflection. Math graduates, on the other hand, do not consider assistance and reflection as to develop their professional skills. They believe the more technical Math content they know, the better teacher they will be. Practices are considered a mandatory part of the course.

Furthermore, both programs report a positive impact regarding the practices carried out throughout the course, as these activities provided an important experience in building confidence in their professional actions, even though this reflection was constructed in different ways by the graduates. This aspect was understood as an important issue concerning the quality of the programs, contributing to the development and (re)construction of the curricula and the educators themselves.

Finally, all the graduates reported being employed as teachers in schools, which serves as an important piece of evidence validating our analysis, helping us to understand the positive

impacts the programs had on the professional development of the graduates, and how the institution provided a training that led the graduates to continue working as teachers.

After reflecting on the data, the understanding emerges that the development of a teacher's competence is *dynamic*, which means it's flexible, constructed along and after the course, on the teaching practice after the graduation course. Both Languages and Mathematics graduates point out *practices* consist in the *turning point* of their development, or it is said, the moment when they realized they became "teachers" was during the practices. Due to this, practices are so important since the beginning of teaching graduation courses, as they provide opportunities for assistance (self/other), internalization and recursion for the pre-service teachers – integrating the four levels of the ZPTD, promoting a dynamic teacher's professional competence development.

Further studies could expand this discussion and contribute to enhancing the quality of education in Brazil. One key approach is for schools to motivate students to consider teaching as a career, creating an early awareness of the profession's importance. Additionally, it is crucial that teacher training programs incorporate deeper discussions about the role of teachers and foster continuous reflection on teaching practices within their curricula. As research has shown, better teacher graduate programs produce better teachers, and better teachers are essential for improving education outcomes. High-quality education, in turn, has a direct impact on social development, fostering a more informed, skilled, and engaged society. Therefore, investing in the improvement of teacher education is not only an investment in the profession but also a fundamental step toward advancing the broader educational and social goals of the country.

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### Bridging 21st Century Skills and ICT Integration in Physics Education: A Bibliographic Analysis

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### Abstract

The integration of Information and Communication Technologies (ICT) in education has the potential to significantly enhance teaching and learning. While existing studies offer numerous recommendations for using ICT in education, they often lack a clear description of the didactic purposes and the specific 21st century skills that can be developed through these technologies. Moreover, many studies focus on the phenomenological aspects without addressing the psychological and physiological justification for the proposed methods. This study aims to address these gaps by conducting a comprehensive bibliographic analysis to determine the didactic goals of using ICT in physics lessons, to compare these goals with the 21st century skills that can be developed through specific ICT tools. Our objective is to provide a clearer understanding of how ICT can be effectively employed to foster both subject mastery and essential modern skills. A systematic search was conducted across multiple academic databases, including Google Scholar, Web of Science, and Scopus, focusing on publications from the last 5 years. We identified 23 relevant studies and analyzed them using qualitative content analysis techniques. Our findings indicate that ICT in physics education serves multiple didactic purposes, which align closely with the development of 21st-century skills. Despite these benefits, the analysis also highlighted a need for more research on the psychological and physiological impacts of ICT use in education. The study concludes with recommendations for clearly defining the didactic purposes of ICT tools and considering their broader implications on student development.

Keywords: 21st Century Skills, Information and Communication Technologies, Physics Education, Qualitative Content Analysis Techniques

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### Introduction

Modern education in the face of rapid technological advances is faced with the need to develop 21st century skills in students. These skills include critical thinking, creative problem solving, teamwork and effective communication, and digital literacy. In the context of teaching physics, these skills are particularly important because the subject area requires not only a deep understanding of fundamental concepts, but also the ability to apply knowledge to solve real-world problems closely related to modern technology. The use of information and communication technologies (ICT) in physics education has become an effective tool to promote the development of these skills, creating conditions for a more interactive, exploratory and practice-oriented approach to learning.

In recent decades, steps have been taken in many countries to integrate ICT into physics education programmes, resulting in a significant increase in learning and teaching opportunities. However, exactly how ICT integration affects the development of 21st century skills in pupils and students remains under-researched. The current analysis aims to systematise and evaluate the existing research on this topic in order to identify the most effective approaches and technologies that contribute to the development of necessary competences in physics teaching.

The research question that we have been trying to find an answer to was "How can Information and Communication Technologies (ICT) be effectively integrated into physics education to simultaneously enhance students' mastery of physics concepts and develop essential 21st-century skills such as critical thinking, problem-solving, and collaboration?"

Existing research demonstrates the positive impact of ICT use on the educational process in physics, in particular on the development of students' research and experimentation skills. Authors such as Wang et al. (2024) and Becker et al. (2020) emphasise the use of mobile technology and virtual laboratories for experimentation, which promotes students' independent research and critical thinking skills. Rubio-Tamayo et al. (2017) and Ramankulov et al. (2016) highlight the role of digital simulations and multimedia in developing students' in-depth understanding of physical processes and their real-life applications. At the same time, Ouadoud et al. (2017, October) point out the importance of learning platforms and learning management systems for organising and structuring learning material to enhance topic mastery and develop self-management skills.

Thus, current research substantiates the importance of ICT integration in creating an interactive learning environment that supports the development of key 21st century skills. However, to date, there is limited work focusing on systematically analysing these approaches and their role in physics teaching. The present study aims to fill this gap, thus enhancing the understanding of effective methods and technologies in this area, and suggesting directions for further research.

### Methodology

In order to achieve the research objectives, a comprehensive bibliographic analysis was conducted to identify the didactic goals of ICT application in physics teaching and to relate them to the 21st century skills that can be developed with the help of various ICT tools. The methodology of this study consists of several stages and uses different methods of analysis to systematise and interpret the data obtained.

To obtain up-to-date data, a systematic search of major academic databases such as Google Scholar, Web of Science and Scopus was conducted, focusing on publications from the last 5 years. The main keywords and search terms included "ICT in physics teaching," "21st century skills in education," and "didactic goals of ICT." After applying inclusion and exclusion criteria for relevant studies, 23 articles were selected to meet the aims of this analysis. Only articles directly related to the development of 21st century skills through the use of ICT in physics education were included.

A qualitative content analysis method was used to structure the data from the selected articles to identify the didactic goals of ICT use and map them to specific 21st century skills. First of all, each article was analysed in terms of the use of ICT tools such as digital simulations, virtual laboratories, learning platforms, mobile applications and multimedia materials. Particular attention was paid to the purposes of using these technologies: supporting experimental activities, developing critical thinking, and increasing student interaction and collaboration. The data were then categorised into categories reflecting the main purposes of ICT use and related skills.

### **Results and Discussion**

The qualitative content analysis of the 23 selected publications followed a structured process to ensure a thorough and systematic evaluation. The stages of the analysis included data preparation, coding, categorization, and interpretation, all aimed at understanding how ICT integration in physics education aligns with the development of 21st-century skills.

The 23 publications were collected from databases such as Google Scholar, Web of Science, and Scopus, focusing on studies from the last five years. Each publication was reviewed to confirm its relevance to the research question, ensuring that it specifically addressed ICT integration in physics education or the development of 21st-century skills.

Studies were included based on criteria such as publication date, relevance to ICT tools in physics education, and discussion of 21st-century skills. Initial coding is the first step in analyzing the data collected from the 23 selected publications. It involves breaking down the text into manageable pieces and assigning labels (codes) to capture key ideas, patterns, and concepts.

A total of 58 initial codes were identified across the 23 studies. These codes covered a broad spectrum of ICT tools and didactic purposes, as well as specific 21st-century skills promoted through ICT in physics education.

Codes that appeared frequently or addressed similar concepts were grouped into larger categories. This step aimed to create a clearer structure, where related ideas were connected. For instance, codes like "Simulations," "Virtual Labs" and "Interactive Tools" were grouped under the broader category "ICT Tools for Conceptual Understanding." Interpretation and thematic analysis is where the refined categories from the focused coding are analyzed indepth to identify larger themes, patterns, and relationships across the studies.

In the context of this study, didactic goals refer to the specific educational objectives and outcomes that educators aim to achieve through the structured use of instructional methods and tools. These goals are centered on the effective teaching and learning of physics concepts, facilitated by the integration of ICT.

In Figure 1, the VOSviewer visualization of first-stage articles is presented. The qualitative content analysis of the 23 studies reveals that ICT plays a crucial role in physics education, particularly in fostering 21st-century skills. Tools such as simulations, virtual labs, and collaborative platforms not only enhance students' conceptual understanding but also promote the development of essential competencies, including critical thinking, problem-solving, and collaboration.



Figure 1: VOSviewer Visualization of First-Stage Articles

Information and communication technology (ICT) integration into physics classes has grown to be a potent instrument in contemporary education for improving students' acquisition of subject-specific knowledge and the development of 21st-century skills. The didactic aims of ICT use in physics instruction frequently coincide with the overarching educational goal of equipping students with 21st-century skills including digital literacy, creativity, problemsolving, critical thinking, and teamwork. This comparison examines how the development of these crucial skills is influenced by and overlaps with the pedagogical objectives of employing ICT in physics instruction.

# 1. Didactic Goals: Enhancing Conceptual Understanding vs. 21st-Century Critical Thinking and Problem-Solving

Improving conceptual understanding is the main didactic objective of ICT integration in physics education. Students find it challenging to understand physics' intricate and abstract ideas (such as electromagnetic and quantum mechanics) when receiving standard lecturebased training. By enabling students to observe and change variables in real-time, ICT tools like interactive models, virtual laboratories, and simulations help make these abstract concepts more concrete.

Specific ICT tools contribute to the development of critical thinking (Haryani et al., 2021) and problem-solving skills (Hasanah & Malik, 2019), which are key competencies in the 21st

century. Tools like simulations and virtual experiments enable students to test hypotheses, experiment with different scenarios, and analyze data, promoting an inquiry-based approach to learning.

For instance, by varying variables like length, mass, and gravity, students can model forces in a pendulum experiment in a virtual physics lab. Students are prompted to test hypotheses, critically examine the connections between variables, and hone their comprehension in light of experimental findings. Comparison: By compelling students to interact with the content, the pedagogic goal of improving conceptual comprehension through ICT naturally fosters critical thinking and problem-solving skills, even though it is centered on extending knowledge of physics. The same ICT tools are used to promote both the educational goal and the 21st-century skill of problem-solving, demonstrating a notable overlap in their results.

### 2. Didactic Goals: Promoting Active Learning vs. 21st-Century Creativity and Innovation

Another didactic goal is to foster active learning through student-centered approaches. ICT tools encourage students to take an active role in their learning rather than passively receiving information. Tools like interactive simulations, augmented reality (AR) applications, and game-based learning environments help students explore physics concepts in ways that are engaging and allow for experiential learning.

These same tools promote creativity and innovation by providing students with opportunities to approach problems from multiple perspectives and experiment with different solutions. Game-based learning (Priyaadharshini et al., 2020), for example, introduces elements of design, allowing students to build models or create simulations that represent physical phenomena.

For instance, students may create and test various structures to withstand simulated forces in an augmented reality environment, encouraging creativity in problem-solving and ingenuity in solution design. In contrast: Since ICT technologies like simulations and augmented reality allow students to investigate open-ended topics, the pedagogic objective of encouraging active learning is in line with the 21st-century abilities of creativity and invention. These technologies meet pedagogical and contemporary skill development goals by encouraging students to explore, invent, and come up with creative solutions through interactive platforms.

## 3. Didactic Goals: Facilitating Collaborative Learning vs. 21st-Century Collaboration and Communication Skills

The integration of ICT in physics lessons also aims to facilitate collaborative learning. Through tools such as online learning platforms, collaborative cloud-based applications, and discussion forums, students can work together to solve problems, share ideas, and engage in group-based experiments or projects.

Collaboration is a cornerstone of 21st-century education (Sutarno et al., 2019), where the ability to work in teams and communicate effectively is increasingly important. Tools like Google Docs, Zoom, or shared simulations allow students to collaborate across different physical locations, promoting both collaborative problem-solving and communication skills. ICT platforms help students coordinate tasks, share data in real-time, and debate scientific ideas, mirroring real-world scientific collaboration.

As an illustration of contemporary team-based scientific research, students can split tasks, upload data, and communicate discoveries in real-time while working on a group project to build a physics experiment utilizing a shared web platform. Comparison: The development of 21st-century communication and collaboration abilities is directly supported by the instructional objective of encouraging collaboration through ICT. Students practice skills that are critical in both academic and professional contexts by utilizing ICT platforms that facilitate shared workspaces and real-time communication. Students' ability to work well in teams is developed using the same resources and techniques that are used to accomplish the educational goal of collaborative learning.

# 4. Didactic Goals: Increasing Engagement and Motivation vs. 21st-Century Digital Literacy

A crucial didactic goal is to increase student engagement and motivation through the use of multimedia and interactive tools. Physics can be perceived as difficult or abstract, but ICT tools like animations, video tutorials, and interactive simulations make learning more engaging by presenting information in dynamic and accessible ways. These tools help to demystify complex topics and keep students motivated.

Through exposure to various ICT tools, students naturally develop digital literacy, which is an essential 21st-century skill. Digital literacy involves the ability to use digital tools effectively, understand digital content, and critically evaluate the use of technology (Misbah et al., 2024). By working with ICT in physics, students become familiar with software, simulations, and digital content that they will likely encounter in higher education and professional fields.

Example: Students might use a multimedia platform to watch video tutorials on concepts like thermodynamics, after which they apply their knowledge through interactive quizzes and simulations. This not only boosts engagement but also enhances their digital fluency. Comparison: The didactic goal of increasing engagement through ICT aligns closely with the development of digital literacy. As students become more engaged through interactive tools, they simultaneously acquire the skills needed to navigate and use these technologies. The enhanced motivation from engaging multimedia tools fosters a hands-on learning experience, where digital literacy is an inherent outcome of the learning process.

### Conclusion

In this article, a bibliographic analysis was conducted to explore the didactic goals of using ICT in physics education and their relationship to the development of 21st century skills. The analysis showed that the greatest attention in the literature is given to the use of ICT to enhance students' experimental and research skills and to improve interaction and co-operation in the learning environment. The study highlighted effective approaches to the use of ICT in physics teaching that promote the simultaneous development of subject knowledge and competences required in the modern world. However, it was also identified that gaps remain in the literature regarding a systematic approach to assessing the impact of ICT on the development of selected 21st century skills.

The findings emphasise the importance of further research and the development of methodologies that will effectively integrate ICT into physics teaching for students' all-round development as well as to enhance their readiness for the digital economy.

### Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

Authors used ChatGPT in the writing process to improve the language and readability of their paper.

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### Collaborative Work at School as a Tool for Demedicalization

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#### Abstract

This text is an excerpt from ongoing master's research entitled "Collaborative work as a demedicalizing tool," which aims to problematize how collaborative work can contribute to the production of possible demedicalizing/depathologizing practices in the school context. As postulated by Capellini (2005), Viralonga (2014), Zerbato (2014) and Zanata (2005), there are many studies that discuss the schooling of students in the regular classroom that prove that the work of the ESA teacher goes beyond the multifunctional classrooms. Thus, in this article, we present a study problematizing how the collaborative work carried out by the ESL teacher in the classroom can be crossed by medicalizing discourses, and the lack of knowledge about these discourses means that their practices and outlooks contribute to the medicalization of the subjects practicing at school. Understanding the term "medicalization" goes beyond medication; we mean the process of artificially transforming social, historical and political issues into medical ones. Collaborative work is one of the ways in which these discourses can be problematized, offering a set of demedicalizing practices with the aim of transforming them. Thinking about inclusion means reflecting on school practices, not just enrolling students in schools to comply with legislation. Inclusion goes beyond compliance; it is necessary to rethink the pedagogical practices offered and analyze whether they are contributing to the formation of subjects involved in a socially referenced quality teachinglearning process in which everyone fits.

Keywords: Specialized Teacher, Specialized Educational Care, Medicalization

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### Introduction

The issue of school inclusion has generated a lot of debate in Brazil, especially due to the consecutive increase in the number of special education students enrolled in mainstream schools. In Brazil, students considered to be special education students study together with other students and this is provided for by the National Policy for Special Education from the Perspective of Inclusive Education (2008, p. 15), which highlights:

- Students with disabilities are those with long-term physical, mental, intellectual or sensory impairments;
- Students with global developmental disorders are those with qualitative alterations in reciprocal social interactions and communication, a restricted, stereotyped and repetitive repertoire of interests and activities. This group includes students with autism, autism spectrum syndromes and childhood psychosis;
- High ability/gifted individuals show high potential in any of the following areas, alone or in combination: intellectual, academic, leadership, psychomotor and arts. They also display high creativity, great involvement in learning and accomplishing tasks in areas of interest to them.

In this scenario, Capellini (2004), Viralonga (2014), Zerbato (2014), Zanata (2004), postulate that many studies point to the schooling of these students in the regular classroom, thus proving that the work of the Specialized Educational Assistance (SEA) teacher goes beyond the Multipurpose Rooms.

Linked to this, the work of the Specialized Educational Assistance (SEA) teacher is not restricted solely to the Multifunctional Rooms. This professional is linked to other spheres within the school unit and, from this point of view, Collaborative Work is understood from a broader perspective, which makes it possible to contribute to the entire educational process. We will use the nomenclature Collaborative Work due to the adoption of this term in the municipal network of Colatina-ES.

Thinking about the inclusion of Specialized Educational Care students means reflecting on school practices, not just enrolling them in schools, complying with legislation and saying that there is an inclusive school. Inclusion goes beyond compliance; it requires a rethink of the pedagogical practices offered and an analysis of whether they are contributing to the training of these subjects as members of a socially referenced quality education that produces meaning for their lives. In Brazil, this Specialized Educational Care called the AEE, so we refer to it in this article with that nomenclature.

Interspersed with medicalizing discourses produced in everyday school life, the learning of children who are the target of special education in the school process can be delimited by a medical report and according to clinically established norms. As Oliveira (2019, p.13) points out,

The constitution of medicalization through discourse helps us to understand medicalization as a more complex process than the abusive use of medicines, but as a web that involves relations of knowledge and power, normalization, the creation of labels and stigmas, the modes of social, cultural and historical organization that give rise to such discourses.

Constantly, the inclusion of special education students in ordinary classrooms produces stereotyped attitudes, as Mazzotta (1982, p.3) cites, "in a pessimistic social consensus, based essentially on the idea that the condition of being "incapacitated," "handicapped," "invalid." As the author further states, more than the "label" or classification that is given to the child, it is their pattern of individual characteristics that determines how they should be taught.

On many occasions, the task of identifying a child who needs to be referred to the health area is almost routine, so commonplace that it's easy to do. And unfortunately, in many cases, the ESL teacher contributes to making these referrals. Thus, the eye of the specialist in Special Education has contributed to producing the diagnosis.

However, in Collaborative Work at school through Specialized Educational Assistance, several of these clinical speeches have been converted into gradual changes in attitudes that occur satisfactorily, what used to be just some leaflet to scribble on, has now been rethought with the aim of meaningful learning with these students.

In dialogues about teaching practices, many subjects are debated, mainly on the central theme of learning, and these problematizations are the starting point: in addition to access, what needs to be thought about in terms of the participation of special education children in the school process?

In this vein, we reflect on the contribution of the Specialized Educational Care teacher from the perspective of demedicalizing practices, as Arantes (2017, p.99) states: "the sensitivity of the gaze manufactures demedicalization in process, creating possibilities for the resignification of differences, reinventing Specialized Educational Care and disarming pathologizing automatisms."

We then consider these subjects as active participants in teaching and learning, linking collaborative work and the common room teacher as possibilities for demedicalizing practices and analyzing the effectiveness of meaningful practices for the training of subjects, both students and students, strengthening an inclusive education that considers the potential of students.

### **Understandings of Collaborative Work**

In order to understand the nomenclature used in the municipality of Colatina - ES for Collaborative Work, the following are similar understandings of the perspectives of Co-teaching. We highlight Collaborative Work as a support service for inclusion, as Mendes, Viralonga and Zerbato (2022, p.26) put it: "the co-teaching work model is based on the social approach because it assumes that the school must be modified and that the teaching provided in the ordinary classroom must be qualified."

At national level, CNE/CEB Resolution No. 4/2009, in its article 5, states that:

AEE is carried out, as a priority, in the multifunctional resource room of the school itself or in another regular education school, in the reverse shift of schooling, not being a substitute for ordinary classes, and can also be carried out in a Specialized Educational Care center of the public network or of community, confessional or philanthropic non-profit institutions, in agreement with the Department of Education or equivalent body of the States, Federal District or Municipalities.

Acknowledging the fact that, according to the Resolution, care is provided in resource rooms during the student's opposite shift, we do not advocate in this article that Specialized Educational Care (AEE) be provided during the same period as the student is in the classroom, as this would make it a substitute and reinforce exclusion. In this sense, we point to Collaborative Work in the classroom as a possibility if we understand its purpose and its real potential.

In addition, it is necessary to problematize the provision of education to these students and to reflect on whether the school is truly inclusive, not just enrolling them. Capellini (2004, p.51) states that "an inclusive school should not just be built on good intentions, it should be made up of concrete actions that enable all children to learn."

In this sense, Vilaronga (2014, p.20) points out that:

Scientific literature from countries more experienced in school inclusion practices has pointed to collaborative work in the school context as a strategy on the rise, both to solve problems related to the teaching and learning process of PAEE students and to promote the personal and professional development of educators.

Collaborative work transcends the Resource Room, and in this vein, national studies have pointed out that the ESA as the only model of support service has not been sufficient for the learning of students in ordinary classes. In this approach, the collaborative perspective of coteaching would be a possibility to contribute to students' learning.

Although the collaborative perspective appears in the documents as:

- CNE/CEB Resolution No. 4/2009, article 13
  VIII liaise with teachers in the ordinary classroom to provide services, pedagogical
- and accessibility resources and strategies that promote student participation in school activities.
- CNE/CEB Resolution No. 2, of September 11, 2001, in its 6th article
- IV specialized pedagogical support services, carried out in ordinary classes, by means of: a) the collaborative work of a teacher specialized in special education.

The presence of collaboration between school professionals is notable in the normative documents, but it is not yet clear how this collaborative perspective takes place, nor is the teachers' knowledge of this support service. From this perspective, the municipality of Colatina-ES has introduced Collaborative Work. In this sense, Costa (2021, p.30) points out that "most ordinary classroom teachers and Special Education specialists are unaware of Collaborative Teaching, and continuing education programs that take this approach are still scarce."

To understand Collaborative Teaching, Capellini, Zanata and Pereira (2012, p. 10) point out that:

Collaborative teaching is an inclusive teaching strategy in which the regular classroom teacher and the teacher or specialist collaboratively plan teaching procedures to help serve students with disabilities in regular classrooms, through an adjustment on the part of the teachers. In this model, two or more teachers with different working skills come together in a cohesive and coordinated way, i.e. in a systematized work, with previously defined functions to teach heterogeneous groups, both in academic and behavioural matters in inclusive settings. Both share responsibility for planning and implementing teaching and classroom discipline.

In this way, both teachers participate in the students' teaching and learning process, with the mainstream teacher being responsible for the content to be taught, while the special educator is responsible for the strategies to promote the process. There is no separation of the students, or definition of "these are your students and these are mine," but the idea that they are "our students."

Many still have the idea that the Collaborative Work teacher goes into the classroom to monitor, evaluate teaching practice, but the aim is to rethink teaching practices so that together they foster student learning, not just for special education students, but for all students.

Viralonga (2014, p.20) points out that "with specific regard to the goals of school inclusion, specialists, special education teachers and ordinary education teachers are having to learn to work together to ensure that all PAEE students achieve better results."

It also states that collaborative teaching or co-teaching is one of the support proposals in which a regular teacher and a specialized teacher share responsibility for planning, instructing and evaluating the teaching offered to a heterogeneous group of students.

Providing a socially qualified education for students with disabilities requires more than compliance with legal regulations. It is essential to transcend traditional models and implement more effective articulations in pedagogical practices.

### Methodology

The main tool used in this research is the principles of cartography. "To map is to follow processes," and we try to point out that processuality is present at every moment of the research (Barros; Kastrup, p.73).

One of the researchers working on this research will be part of the investigative process, bringing her teaching practice *on site*. The research site is an elementary school run by the Colatina City Council, where one of the proponents of this research works as an employee. This study will focus on just one location, as Sousa and Oliveira (2022, p.24) state from this perspective, the rigor of research lies in its proximity to life and its precision lies in the commitment and interest of the researcher, as an implication in reality and as an intervention.

Sousa and Oliveira (2022, p.25) also point out that:

This perspective of a multiple and complex understanding of reality requires the researcher to be welcoming and flexible and open to recursion, to the unexpected and, consequently, to re-elaboration, in other words, to the unfinished and provisional nature of a type of research that does not result in ready-made truths, but rather the possibility of the constant emergence of new questions, issues and new beginnings.

Initially, the aim is to build up knowledge together with the research participants, teachers, management team and students. From this construction of knowledge, we will map how

medicalizing discourses are present in pedagogical practices through interviews and observations.

The research aims to experience joint planning with ordinary classroom teachers on demedicalizing practices and finally produce an educational product that contributes to reflections on the medicalizing discourses present in the school.

To do this, we cut out the data produced and then drew up a table with the participants so that we could better understand the target audience for special education in this research. The participants were given a Free Informed Consent Form (FICF), which explained the whole procedure of this research and if they could withdraw.

PARTICIPANTS	GENDER	AGE	DIAGNOSTIC	ATTENDS AEE
			CLASSIFICATION	
P 1	Male	7 years	Intellectual disability	Yes
P 2	Male	8 years	Autism	Yes
P 3	Male	8 years	Intellectual disability	Yes
P 4	Female	11 years	Intellectual disability	Yes
P 5	Male	10 years	Intellectual disability	No
P 6	Female	10 years	Intellectual disability	Yes

Source: prepared by the author.

In relation to the table above, the students total 6 (six), of which only 2 (two) are female and 4 (four) male, only 1 (one) is classified as autistic and the others as intellectually disabled.

So we interviewed these participants about the de-medicalizing perspectives from Collaborative Work, which will be discussed below.

### **Demedicalizing Perspectives From Collaborative Work**

The process of medicalization permeating the school environment and beyond has advanced, and to go against this logic at school is to bet on pedagogical work and to recover, as Bassani (2018, p. 181) states, that "school is a place for teaching and learning, not for clinical diagnoses; it is a place for learning assessment, not for diagnostic assessment in the medical field."

To reclaim this place of empowerment for the school, for pedagogical work, is to depathologize the medical dictates that have been embedded in this space for decades. We need to broaden these discussions, whether it's in on-the-job training, in training within the school or in dialogues with the staff.

I'm not arguing that diagnoses and medicines aren't necessary, but the way in which they are produced and customarily imposed on the child. In this sense, valuing human diversity and

depathologizing the education of children with disabilities helps us to depathologize the education of all children (Moysés; Angelucci, 2021).

In order to understand de-medicalization, we need to recognize that we are all medicalized, that we come from social and cultural contexts and from a hegemonic, capitalist society. And to break away from medicalization is to discern that the reports and diagnoses that permeate the educational field are instruments of obedience, of silencing, and it is essential to resignify and question this reality.

Demedicalization is not ready, it has no concepts, it is constructed, it happens in everyday life, and thought out together with teachers, with families in what Arantes (2017, p. 99) demarcates in "shared bets on demedicalization are political attitudes in their most powerful sense and invite the invention of non-'teaching' practices." This creates possibilities for reinventing and resignifying pedagogical practices and, consequently, Specialized Educational Care.

From this perspective, Silva and Baptista (2021, p. 60) state that "investing in a depathologizing and de-medicalizing perspective, as a new perspective for the analysis of social processes and diagnoses, continues to be our great challenge." This challenge requires investment in teacher training, problematization and reflective spaces.

In this way, collaborative work contributes to these problematizations. To this end, it is vital that the training of these special education teachers goes against the medical perspective, in other words, the continuing training of these professionals needs to be thought of beyond models of disability, beyond classifications. But, in modern times, "openness to others who are different from me is a revolutionary pedagogy based on historical-critical pedagogy" (de Melo, 2024, p. 43).

de Melo (2024, p. 43) further states:

- 1) The student is our best teacher!!!
- 2) We need to work on the human first.

If we understand these considerations that de Melo addresses, we will be able to go against Medicalization.

In order to understand the first consideration, we will look at the students' conceptions of how Collaborative Work can contribute to demedicalization.

So we asked them how they felt when the special education teacher came to the classroom:

Happy, I like it. (P1, interview transcript)

Because the things you teach me here at AEE help me in the classroom. (P 2, interview transcript)

You go to help everyone, it's good! (P 4, interview transcript)

Help others. (P 3, interview transcript)

The naturalization of Collaborative Work in this institution helps to affirm that this support service is de-medicalizing, which is noticeable when the students say that it goes to help everyone and not just them, that it collaborates with the teachers as a whole. And in the reflection when P 4 asks the Special Education teacher: "Auntie, why does the trainee stand next to me in the classroom? Why do I have a certificate?" And when I ask her again if I'm on her side, she replies, "No, you're for everyone!"

Collaborative work in transversality, in changing structures beyond diagnosis, beyond disability, and betting on an education that meets the expectations of people with disabilities, in their individuality and providing learning conditions, so that they are not just at the mercy of socialization.

Analyzing how access to schooling for special education students and how it has been offered is a guarantee of the fundamental right to education. de Melo and Mafezoni (2019. p.10) point out the particularities and challenges of this process, which we still experience when they state that:

In the case of special education students, it is very common for them to be alienated from the teaching-learning process, even in the classroom. In practice, while the other students are learning the historically and systematically established content of the school subjects (Portuguese, Mathematics, History, Geography, etc.), the majority of students with disabilities are in the corners of the classrooms scribbling, painting, forever learning the vowels, in a process of infantilization of the subject.

The authors de Melo and Mafezoni also problematize the practice of removing students from the regular classroom to avoid possible interruptions in the progress of lessons, offering individual activities in the resource room.

de Melo and Mafezoni also propose that we reflect on these current experiences in the school environment and recognize that the work of the Specialized Educational Assistance teacher needs to go beyond the Resource Room, betting on a transversal perspective playing a crucial role in various spheres within the school, promoting collaborative work or co-teaching that covers the entire educational process.

This makes it necessary to take a different look at the contributions of Collaborative Work in the common room and, above all, how pedagogical practices from a demedicalizing perspective can contribute to meaningful learning. We corroborate and believe that it is necessary to reflect critically and urgently break away from a clinical and medicalizing view that perceives people with disabilities as "carriers" of pathologies that must be cured, leaving the educational aspect in the background (de Melo, 2024). And yet, says the author, there is life beyond disability. And in the meantime, we believe that every child learns, and that it is necessary to change teaching strategies as often as necessary.

### Conclusion

We know that medicalizing discourses permeate the school environment and that the role of the Special Education teacher in Collaborative Work goes beyond the Multipurpose Rooms. Working together with other school professionals displaces socially and historically constituted clinical practices and discourses on the labels and stigmas of subjects. It contributes to an emancipatory education, establishing a direct link with the curriculum offered in the common room, in a pedagogical bet that constitutes qualitative leaps in learning. In this respect, there is no ready-made recipe for the predictability of a clinical diagnosis. With this work, we hope to problematize medicalizing discourses and reflect on: what can a child do? what can a student do? what can a teacher do? what can education do?

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### A Comparative Study to Evaluate the Impact of Using the SOLO Taxonomy in Preparing Exam Questions

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#### Abstract

Evaluation is a complex task that requires clear and transparent criteria, ensuring all involved understand it as credible, with educational and social responsibility. However, as evaluation is not an exact science, it is naturally subjective. Do teachers prepare questions covering all levels of complexity? Do they reflect on the knowledge and complexity required for each question? What methods and tools do they use? In higher education, studies on evaluation are few, and in mathematics subjects, they are almost non-existent. Greater reflection on this topic in higher education institutions is needed to deepen knowledge. The SOLO taxonomy, developed by John Biggs and Kevin Collis, in 1982, includes five levels of learning complexity: pre-structural, unistructural, multi-structural, relational, and abstract. The authors have used this taxonomy to assess exam quality and identify cognitive complexity levels needed for assessments. The SOLO taxonomy should be used by teachers to formulate questions, classifying them according to cognitive complexity and assigning appropriate weights in student evaluations. This approach helps identify areas for student improvement, aiming for greater academic and professional success. This paper presents a comparative study of results and discussions based on an evaluation of Linear Algebra program content common to subjects from three different undergraduate programs at different higher education institutions. In the study, students took an exam with questions structured according to an ascending process of cognitive complexity, based on the SOLO taxonomy.

Keywords: SOLO Taxonomy, Assessment, Learning Complexity, Mathematics, Higher Education

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### Introduction

Written assessments present several challenges for both teachers and students (Bennett 2011; Khan, et al., 2023; Struyven et al., 2003; Zlatkin-Troitschanskaia, et al., 2016). The latter often express a sense of discrepancy between the knowledge they possess on a given subject and what they are able to demonstrate in a written evaluation. For teachers, this difficulty is immediately felt in the creation of questions, as they need to adequately cover the topics being assessed in a clear and fair manner while ensuring the questions align with their intended goals. A written exam, such as the implemented in this study, should therefore be carefully designed to effectively assess students' understanding and skills across different levels of complexity without redundancies. This approach aims to provide useful and detailed feedback to students, which plays an important role in the learning process (Duffield & Spencer, 2002; Henderson et al., 2019), identifying areas that require greater scientific and pedagogical investment tailored to their needs, with the goal of promoting a more targeted and in-depth effort from both teacher and student.

The SOLO taxonomy (Structure of the Observed Learning Outcome) is a valuable tool in educational assessment at all levels of education (Caridade & Pereira, 2024; Svensäter & Rohlin, 2023). SOLO is a methodological instrument developed by John Biggs and Kevin Collis in 1982 (Biggs & Collis, 1982), used to describe the increasing complexity of a student's understanding of a task. It categorizes student responses based on the level of understanding they demonstrate, ranging from simple to complex. It is used in different educational settings to assess and guide the development of student thinking and knowledge (Brabrand & Dahl, 2009; Caridade & Pereira, 2023; Hodges & Harvey, 2003).



According to Biggs and Collis, the SOLO taxonomy consists of five levels as shown in Figure 1, which describe how students process information, from the simplest to the most complex understanding:

- 1. Prestructural At this level, the student does not understand the task or content in a meaningful way. The response may be irrelevant, confused, or completely incorrect. Knowledge is fragmented, and there is a lack of structure to organize the information.
- 2. Unistructural The student demonstrates a limited understanding, focusing on only one isolated aspect of the concept or content. They recognize basic information but fail to connect it with other concepts.
- 3. Multistructural The student understands more aspects of the task but treats each part separately without making connections between them. They may list or describe multiple elements, but they don't integrate them into a coherent structure.

- 4. Relational At this level, the student can integrate and relate various parts of a task or concept, forming a more holistic and interconnected understanding. They start to see how different parts fit together to form a whole.
- 5. Abstract This is the highest level of the SOLO taxonomy, where the student can generalize from their understanding, applying knowledge to new contexts or situations. They can think abstractly and make complex inferences based on what they have learned.

In this study, a written assessment was implemented in Mathematics Courses (MC) of three different degrees, namely, Sustainable Management of Cities from the Institute of Engineering of Coimbra (ISEC), Management from the Portuguese Catholic University (UCP) and Management from Coimbra Business School (ISCAC). The work was prepared during the second semester of the academic year 2024/2025 when conducting the examinations of the respective (MCs) at university/institution facilities. The exam questions were prepared based on the SOLO taxonomy and were responded by the 191 Portuguese first-year students involved in the study. The aim was to classify the knowledge acquired by those students and highlight the topics and corresponding levels of complexity where learning needs to be reinforced, with the goal of pedagogically intervening to enhance academic success and increase both teacher and student satisfaction. The topics assessed pertained to matrix calculus, which does not require significant prior knowledge of Mathematics from the students. For this reason, another objective of the study was to compare the results obtained among the three groups of students based on their respective areas of study. Finally, considering the teaching experience of the professors involved in the study, the impact of implementing the SOLO taxonomy in the construction of exam questions, compared to a traditional approach, will be reported.

In this first chapter the introduction is made, in chapter 2 the methodology followed in the construction of the exam questions based on the SOLO taxonomy is presented, and in parallel, a traditional approach to constructing the same questions is also given, in the following chapter the results and discussions and in the last chapter the findings are presented.

### Methodology

The assessment of students in mathematics in higher education is subjective, both in terms of the difficulty of the exercises given to students and the content that is assessed. The teacher, based on his years of experience, can identify the most important syllabus for his students' learning and randomly manage the degree of difficulty he places on the exam exercises. In this study, we intend to construct questions for mathematics exams on the contents of Matrix Systems, Matrices, Operations and their applications prepared by 3 teachers from different schools and different MCs. In the construction of the 3 questions presented, two different methodologies were used: methodology A, where the question is constructed in the traditional way, and methodology B, where the questions were constructed in such a way that the students' knowledge was applied in increasing order of complexity according to the 5 levels of the SOLO taxonomy. For example, instead of just asking the student to discuss a linear system with 2 real parameters (a and b) as represented in question Q1A in Figure 2 (methodology A), the student was asked to initially write the system in matrix form (Q1Ba) and after identifying the values of a and b for which the system: is possible and determined; it is possible and indeterminate and it is impossible (Q1Bb), according to Figure 2 (methodology B).

 $\mathbb{R}.$ 

Q1A. Consider the system of linear equations  $\begin{cases} 2x + y + 2z = b \\ x + z = 1 \\ 2x + y + az = 2 \end{cases}$ ,  $a, b, \in \mathbb{R}$ . Discuss the system in terms

of a and b parameters.

**Q1B.** Consider the system of linear equations 
$$\begin{cases} 2x + y + 2z = b \\ x + z = 1 \\ 2x + y + az = 2 \end{cases}$$
,  $a, b, \in$ 

- (a) Write the system in its matrix form AX = B.
- (b) Determine the values of a and b for which the system is:
  - Possible and determine.
  - Possible and undetermine.
  - Impossible

Figure 2: Question Q1, According to Methodology A (Q1A) and Methodology B (Q1B)

The second way of preparing the question consisted of subdividing the initial question into two distinct items, allowing the student to be guided in solving the exercise. The first item has a unistructural level of complexity and the second a relational level, on the SOLO taxonomy scale (Figure 3 on the left). In the first item (Q1Ba) the student only needs to answer one content (1x) while in the next item (Q1Bb) the student needs to have a varied of knowledge and apply it more than once, for example three times (3x) the classification of systems, and in addition it is important establish mutual relationships (represented by arrow in Figure 3) between the information obtained by the Gauss elimination method and knowledge of system classification. In this question the student moves from the unistructural to the relational level as if he were climbing a ladder with a two-landing jump (Figure 3 on the right). Therefore, additional effort will be required on the part of the student when climbing the stairs, which corresponds, in terms of level of complexity, to the difficulty of building interrelationships between different areas of knowledge and their understanding.



Figure 3: Scheme (Left) and Ladder (Right) of SOLO Complexity for Q1Ba and Q1Bb

In another question (Q2), students were asked to solve the system (the same of Q1), considering a=1 and b=0, if this exists, through the inverse matrix of the system, as shown in Figure 4.

**Q2A.** Resolve the system  $\begin{cases} 2x + y + 2z = 0\\ x + z = 1\\ 2x + y + z = 2 \end{cases}$  if possible, using the inverse system matrix.

Figure 4: Question Q2, According to Methodology A (question in traditional form)

Where do students experience the most difficulty? Why can't students climb the landings? To answer this doubts, question Q2A was subdivided into 4 smaller items of complexity to be able to find out what level the student can reach. Using methodology B (Figure 5), in the first item (Q2Ba) it is necessary to determine the system solution using the given parameters; in the second (Q2Bb) justify the existence or not of the inverse matrix; in the third (Q2Bc) calculate the inverse and in the fourth (Q2Bd) use the inverse to confirm the system solution obtained in the first item (Q2Ba).

**Q2B.** Consider the system of linear equations 
$$\begin{cases} 2x + y + 2z = 0 \\ x + z = 1 \\ 2x + y + z = 2 \end{cases}$$

- (a) Write the system in its matrix form AX = B.
- (b) Justify that the matrix A is invertible.
- (c) Calculate the matrix  $A^{-1}$ .
- (d) Determine the solution of the system AX = B, using the matrix  $A^{-1}$  calculated previously.

Figure 5: Question Q2, According to Methodology B (items Q2Ba, Q2Bb, Q2Bc and Q2Bd)

Figure 6 on the left shows the complexity scheme for each of the 4 items in this question. The level of complexity gradually increased in these 4 items. In the first two items the levels are simpler, only knowledge of one topic is necessary (unistructural), in the third item it is important to have knowledge of two different topics, one of which is applied twice (2x) (multistructural) and in the last item, in addition to knowledge of 3 distinct topics, the relationship between two of the topics is essential (represented by the arrow in Figure 6). The climb between the landings (complexity levels) in the ladder is smoother and more gradual, as shown in Figure 6 on the right.



Figure 6: Scheme (Left) and Ladder (Right) of SOLO Complexity for Q2Ba, Q2Bb, QB2c and Q2Bd

A third question, posed to students, was also constructed using the two methodologies A and B. In Figure 7, the question in a traditional form (methodology A) and in Figure 8, the question divided into 4 items (methodology B).

**Q3A.** Solve the matrix equation  $D^T C^{-1} + X^T (C^{-1})^T = D$  with  $X \in M_3(\mathbb{R})$ , where  $C = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 0 & 1 \\ 2 & 1 & 1 \end{bmatrix}$  is a symmetric and invertible matrix and  $D = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$  is an invertible matrices.

Figure 7: Question Q3, According to Methodology A (question in traditional form)

In the traditional form question, students are asked to solve the given matrix equation with respect to the matrix X, knowing that the given matrix C is symmetric and invertible, and the matrix D is invertible. This question covers different knowledge and the interconnections between them, forcing the student to integrate different areas of knowledge and develop critical and analytical thinking. When the question is presented according to methodology B, four items are considered, referring to aspects that are slightly more abstract than those described in the previous questions and, as such, are more challenging for students to solve.

**Q3B.** Consider the matrix equation 
$$D^T C^{-1} + X^T (C^{-1})^T = D$$
 with  $X \in M_3(\mathbb{R}), C = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 0 & 1 \\ 2 & 1 & 1 \end{bmatrix}$  and

 $D = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$  invertible matrices.

- (a) Justify that C is a symmetric matrix  $(C^T = C)$ .
- (b) Check equality  $(D D^T C^{-1})^T = D^T C^{-1}D$ , using suitable properties.
- (c) Solve the matrix equation given in order to the matrix X and show that  $X = CD^T D$ .
- (d) Based on the previous item, calculate **only** the element in position (3,2) of the matrix X.

Figure 8: Question Q3, According to Methodology B (items Q3Ba, Q3Bb, Q3Bc and Q3Bd)

The first item, being the simplest (unistructural level), asks the student to calculate the transposed matrix and verify that it is symmetric, indicating its definition (Figure 9 left). At the second item, the student is asked to apply properties between matrices at an abstract level, using only unknowns (letters) in their resolution. The difficulty is greater, since the issue is at a relational level and at the third item, the complexity is even higher because although the level of the Solo taxonomy is the same (relational) the requirement for knowledge and skills to be used and interconnected by the students is more demanding, as can be seen in Figure 9 left. Finally, at the fourth item, the complexity decreases a little and the student is asked to show their knowledge based on the previous items. This question, at the multistructural level (Q3Bd), becomes complex, as it is conditioned on the student solving the previous question, which is why it was asked last. The student, when climbing the SOLO complexity stairs, will have to jump a level between the unistructural and relational and then remain a little longer at this level, since the third item still belongs to this level and finally descend to the lower level in the last item (Figure 9 right).



Figure 9: Scheme (Left) and Ladder (Right) of SOLO Complexity for Q3Ba, Q3Bb, Q3Bc and Q3Bd
To investigate the more complex behaviour and capabilities (according to the SOLO taxonomy), developed throughout the students' teaching and learning process, the three questions described above were proposed in the assessments. The questions were selected based on their relevance to the objectives of this study, and analysis of the results will allow not only a reflection on student performance, but also the impact of using the SOLO taxonomy in preparing exam questions. The study was carried out in the second semester of the 2023/2024 academic year, with 149 students from the Management Degree at ISCAC, 10 from Management Degree at UCP and 32 students from Sustainable City Management Degree at ISEC. The ratings for these questions were adjusted to the number of questions involved in each of the exams and the weight attributed to the contents in each of the subjects.

## **Results and Discussions**

Assessment of academic performance is a fundamental tool for understanding the effectiveness of teaching methods and the assimilation of knowledge by students. In this chapter, the results obtained by students in the three specific assessment questions are presented, with the aim of analysing the level of learning, understanding and application of the concepts covered. Next, the collected data will be presented, the statistical analysis applied and, finally, the results obtained, which will be extremely important for a deeper understanding of the evaluation process in higher education.

The data were analyzed according to two procedures: a first comparative analysis of the results of all students (from the 3 schools) to the answers to the questions according to the two methodologies applied (A and B) and a second comparative analysis of the results obtained according to the methodology B in relational SOLO level questions in each of the schools.

#### Comparative Analysis Methodology A Versus Methodology B

In question Q1, at a relational level, represented in Table 1 according to methodology A, only 17.3% of students manage to answer correctly and reach the relational level (82.7% do not reach this level). Regarding the same question according to methodology B, it appears that in the first item (Q1Ba), 88% of students reach the unistructural level (even so, 12% remain at the prestructural level) and in item 2 (Q1Bb) at the relational level, the distribution is: 18.8% prestructural, 9.4% unistructural, 54.5% multistructural and only 17.3% reach the relational level. This shows that more than half of the students can still reach the multistructural level, but many (18.8%) do not respond to anything asked of them.

Question	No-relational			Relational
Q1A		82.7%		17.3%
	Prestructural	Unistructural	Multistructural	Relational
Q1Ba	12.0%	88.0%		
Q1Bb	18.8%	9.4%	54.5%	17.3%

Table 1: Results Obtained in Question Q1 by the Two Methodologies A and B (in %)

In Figure 10, it can be seeing the distribution of the number of students who reach the levels of the SOLO taxonomy in relation to question Q2. On the left applying methodology A (Q2A) and on the right methodology B (Q2B). In Q2A, 16.8% of students can answer correctly and reach the relational level while 83.2% cannot get there. Using methodology B,

it is possible for the teacher to know the distribution of their students' knowledge levels when they answer question Q2. In questions Q2Ba and Q2Bb, both unistructural, students reach the SOLO level with a percentage of 88.0% and 52.9% respectively, and there is a large percentage who do not know the topic covered. In question Q2Bc of multistructural level, 61.3% of students reach the level and 4.7% are at the lower level (unistructural). Regarding question Q2Bd, 16.8% answer correctly and reach the relational level, but 13.6% remain at the multistructural level, 2.1% at the unistructural level and the remaining 67.5% at the prestructural level.



Figure 10: Student Answers to Q2A (Left) and Q2B (Right) According to SOLO Levels (in %)

In the third question (Figure 11) according to methodology A, 19.4% of students solve the question and reach the relational level, but 80.6% do not reach that level. The results obtained with methodology B were: in Q3Ba, 67.5% of students reach the unistructural level; in Q3Bb and Q3Bc, both relational, 22.0% and 8.9% reach this level, with 24.1% and 30.9% at the unistructural level and 10.5% and 8.9% at the multistructural level respectively; in Q3Bd at the multistructural level, 19.4% reach the level, leaving 9.9% at the lower level (unistructural). It is worth mentioning that a large percentage of students do not have any knowledge about the topic, remaining at the prestructural level (32.5% in Q3Ba, 43.5.0% in Q3Bb, 51.3% in Q3Bc and 70.7% in Q3Bd).



Figure 11: Student Answers to Q3A (Left) and Q3B (Right) According to SOLO levels (in %)

#### **Comparative Analysis Methodology B Versus Schools**

The students' answers to the questions presented at the SOLO relational level were analysed, as they are questions with higher levels of complexity and because it is possible in these cases to better observe the distribution of students' knowledge across the SOLO complexity levels. In the first relational level question proposed according to methodology B (Q1Bb), the distributions according to the SOLO levels of the 3 schools involved in the study are represented in Figure 12. In this question the relational level is reached by 16.1% ISCAC, 15.6 % ISEC and 40.0% UCP. Most students in this question are at the multistructural level at ISCAC, unistructural at UCP and prestructural at ISEC. The percentage of students who do not know how to apply or interpret the syllabus assessed in this question is around 10% at ISCAC and UCP and 63% at ISEC.



Figure 12: Student Answers to Q1Bb According to SOLO Levels in the 3 Schools (in%)

Regarding the relational question Q2Bd, the results are presented in Figure 13. In this question, students reach the relational level 18.1% in ISCAC, 9.4% in ISEC and 20.0% in UCP. The SOLO level where most students are located is prestutural (63.8% at ISCAC, 87.5% at ISEC and 60.0% at UCP). This issue has the highest percentage at the prestructural level in all schools, which means that students in general did not learn this syllabus.



Figure 13: Student Answers to Q2Bd According to SOLO Levels in the 3 Schools (in%)

In the third relational question (Q3Bb), represented in Figure 14, 23.5% ISCAC, 3.1% ISEC and 60.0% UCP reached the relational level of the question. Most students were at the unistructural level at ISCAC, at the prestructural level at ISEC and at the relational level at

UCP. The percentage of students who do not have any knowledge of the syllabus assessed in this question is 36.2% at ISCAC, 84.4% at ISEC and 20.0% at UCP. This question reached the highest percentage (23.5%+3.1%+60.0%=86.6%) of students who reached the relational level among the 4 questions that were analysed in the study.



Figure 14: Student Answers to Q3Bb According to SOLO Levels in the 3 Schools (in%)

Lastly, in question Q3Bc (Figure 15), 8.7% of ISCAC students reach this level, 40.0% at UCP and 0% at ISEC. It is worth mentioning that at ISEC no student reached the relational level. Most students reach the unistructural level at ISCAC, the prestuctural level at ISEC and at UCP the percentage of students who reach the relational and prestructural level is the same (40.0%). In this question it was also verified that at ISEC and UCP no student reached the unistructural level.



Figure 15: Student Answers to Q3Bc According to SOLO Levels in the 3 Schools (in%)

## Conclusion

This study investigates the effectiveness of the Structured of Observed Learning Outcome (SOLO) taxonomy in improving exam question preparation. When comparing traditional question formats with those based on the SOLO framework, there are differences in student performance, engagement, and understanding. The study analyses quantitative and qualitative data collected from three groups of students exposed to two SOLO exam questions, with 3

main objectives: to analyse students' perception of exam performance using questions based on the SOLO taxonomy; evaluate student engagement and success in exam formats based on the SOLO taxonomy and collect feedback from teachers about their experiences with questions based on the SOLO taxonomy.

Based on the analysis carried out and discussed in the previous chapter, it appears that with an increase in the level of difficulty of the items, that is, with an increase in the level of SOLO categorization requested in each item, the number of responses at pre-structural levels and the unistructural level also increases. Which means that the student does not have any type of knowledge about the content of the question or only has knowledge of one of the topics necessary to solve the question. In general, the student was unable to gain knowledge of the different topics covered (multistructural level) nor of the interconnection between these topics (relational level). The evidence is highlighted in the answers to questions Q1Bb, Q2Bd, Q3Bc and Q3Bd, especially in question Q2Bd where less than 20% of students in all schools are at the level required by the item and more than half of these students (in all schools) are is at the prestructural level, that is, more than half of the students know nothing about the topic being asked (in 3 different schools, in 3 different courses and with 3 different teachers). This shows that it is a topic that requires more in-depth analysis and a different way of being approached. It was also evident that the application of methodology B in the construction of the questions allows the teacher to assess whether a student can achieve the level of the question (methodology A), what level of knowledge it is at (methodology B). Therefore, the use of questions according to methodology B allows for greater clarity, facilitating student understanding and ensuring that the connections between the different items are understood. By addressing a more specific aspect of the content in each item, the student feels guided and focused only on that aspect, reducing the possibility of omissions and avoiding some confusion. For the teacher, it is easier to identify which specific aspects the student demonstrates the greatest difficulty or lack of knowledge. In summary, methodology B is a strategy that improves communication and understanding, ensuring that all important aspects of a given program content are addressed in a clear and structured way. It can also be seen that in the comparative analysis of methodology B in relation to the 3 schools, the performance is very similar in the 3 institutions and courses that participated in the study. At UCP, the quality of responses to items is higher compared to other institutions, since the sample of students (5% of the sample) compared to the other institutions in the study is small. In the other two institutions, the results are similar, with that of ISEC being slightly lower since the students in this institution's sample correspond to post-work students and come from non-scientific courses where the presence of mathematical content in their school career is limited to the first years, that is, until the ninth year.

As future work, the authors intend to continue investigating the weaknesses and strengths of question construction according to methodology B, based on the SOLO taxonomy. This comparison must be made in relation to mathematical skills, knowledge of the syllabus and skills acquired by the students, as well as the students' opinion on the clarity and ease of answering the questions and the teacher's opinion on the analysis of the information collected.

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## Follow Me! Does this Educational Material Still Motivate Modern EFL Learners to Develop Their Speaking Skills?

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#### Abstract

In previous research, the use of videos was examined to determine its effectiveness in language classes, specifically the development of listening and speaking skills. It was found that videos still produce excellent results in this context. However, artificial intelligence (AI) is starting to dominate educational technology, requiring practitioners to have adequate technological knowledge and reliable Internet access. In contrast, the conventional use of videos, albeit outdated, is straightforward and requires very little technological competence. This study therefore re-examines the use of videos as teaching and learning aids, in order to ascertain the motivation of Saudi female EFL undergraduates to develop their speaking skills. Hence, a quasi-experimental approach was adopted. For one month, the reality TV series Follow Me! was used. determined as Intermediate level English. The students were assigned the task of watching episodes at home at their convenience and then submitting a voicerecorded synopsis of each episode to a WhatsApp group. An electronic survey was administered at the end of the study, adapted from Mhlongo et al. (2022) to cover five domains: Technology-specific motivational components, learner-specific motivational components (self-confidence/anxiety/self-efficacy), learner-specific motivational components (need for achievement/effort), course-specific motivational components, and integrative and instrumental motivational components. Finally, recommendations to reconsider the use of videos in the EFL context were made for stakeholders based on the results.

Keywords: Educational Videos, English Language, EFL, Speaking Skills, Saudi Arabia

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## 1. Introduction

Rapid technological advancements have brought about a significant shift in many sectors, with an identifiable impact on education – major shifts in technology always require adjustments to education. Various educational technologies have been in use since the 1980s, especially following developments in audio-visual material at the time. However, such useful technology has gradually been abandoned in favour of more recent innovations. Nevertheless, while it is important to be able to embrace change, it is also necessary to acknowledge the benefits of certain old-fashioned tools, which have been tested in previous research and implemented successfully over time. One of these conventional technologies is television, whereupon old TV series can now be viewed in a number of convenient ways, for example, on a mobile phone. In particular, short videos are preferred, given the fast pace of contemporary life. Thus, the current study re-examines the use of conventional TV series by today's EFL learners, accessed via YouTube, in order to determine whether these learners are still motivated to adopt videos as a technological aid. In so doing, the study attempts to answer the following research question: *How does using videos impact EFL learners' motivation to develop their speaking skills*?

## 1.1 Significant Objectives of this Research

- 1. This study will re-examine the use of videos in foreign language classes following dramatic technological development.
- 2. This study will recommend the use of videos in EFL speaking classes as a means of presenting authentic material.

## 2. Literature Review

In this review of the literature, the topics of motivation in EFL and the benefits of using videos to help teach EFL language skills will be specifically addressed.

## 2.1 Motivation and Language Learning

Creating a suitable environment to encourage language learners to improve and develop their language skills is a necessity. This will ensure continuity of learning with a stronger chance of the learners acquiring the required knowledge. Most importantly, maintaining and developing the motivation of language learners will have a positive impact on their learning.

Various motivation scales have been proposed by linguists in the literature, whether developed for learners studying a second language (L2) or non-native speakers learning the official language (L1) of a country. For example, Mhlongo et al. (2021) developed their scale to measure the motivation of EFL learners in a multicultural environment. As such, Mhlongo et al. (2021) sought to build a more inclusive and sophisticated scale on the basis of Gardner's Attitude/Motivation Test Battery (AMTB), published in 1985, which is more suited to the Western context (Macintyre et al., 2019).

Using Mhlongo et al.'s (2021) scale, the motivation to learn is measured by considering the socio-educational model of language acquisition included in the AMTP. The model contains three main components of the motivation to learn: integrative orientation, attitude of the learners, and general interest in learning the language (Macintyre et al., 2019). The present

study will reuse this scale by identifying any changes in the motivation of EFL learners through the use of videos as an educational tool.

## 2.2 Revisiting the Use of Videos in EFL Language Skills Classes

The implementation of technology has been a source of interest in the teaching of languages, already considered before the advent of personal computers and the Internet. In an early work by El-Araby (1974), the implementation of technology was already being proposed as a teaching aid. In terms of the four language skills, El-Araby grouped technologies as aids for listening, speaking, reading, and writing, on the premise that the use of language alone to teach languages can become tedious for learners. Consequently, teachers lose the attention of their students, with no means of regaining it. In contrast, when using various technologies as aids, learners are more actively engaged with the learning experience and what is learned in class can be applied in real life. Moreover, the material is presented in small units to facilitate the learners' understanding, and the framework for learning can be organized to allow each student to proceed at his or her own pace. Finally, the technologies used can incorporate tools to guide students in the right direction and provide encouragement at any time and in any location.

One of the multi-skill aids described by El-Araby is the use of closed-circuit television (CCTV) to broadcast video-taped material. Some Arab countries have adopted this method as a beneficial teaching aid. Thus, recorded material like films, TV series, or home videos can easily be transmitted as 'televised' language programmes. El Araby further added that real situations can be recorded using a video recorder and then replayed as required to learners, for example, revisiting material from live television. However, these days, video tapes are rarely used and no longer produced, and even discs have largely been superseded by downloads, streaming services, and online platforms. However, one of the best known online platforms for accessing all kinds of audio-visual material is the social media platform, YouTube.

Larsen-Freeman and Anderson (2013) comprehensively describe the diverse use of technology in language classes, specifically computer assisted language learning (CALL). The above authors highlight that CALL enables social interaction, which helps construct students' knowledge, as each learner can draw upon the experience of his or her peers. Larsen-Freeman and Anderson (2013) add that technology produces individualization, social interaction, and enhanced student motivation.

Larsen-Freeman and Anderson (2013) further describe language as a fixed system that requires adherence to a process, which the use of technology can help learners to explore. In this regard, YouTube was mentioned as an important application of technology, described by the above authors as a website where a short video can be watched, downloaded, shared, or uploaded. Most YouTube videos are available to anyone with an adequate Internet connection. The topics of these videos cover a vast spectrum and include videos of actual language classrooms, lectures, and short vignettes from everyday situations. A further benefit of this platform is that students can enjoy a high level of autonomy while being guided by their teacher, thereby enhancing their motivation. Besides, through authentic videos, students can learn about the everyday life or culture of the speakers of the target language.

In the literature, several studies have examined the use of videos in relation to increased learners' motivation. In an early publication by Secules et al. (1992), the authors mentioned

that the videos permit language learners to witness the dynamics of interaction, as they observe native speakers interacting in real-life situations, using different accents, registers, and paralinguistic cues (for example, gestures). Goldstein and Driver (2014) mention that videos may be accessed by learners via tablets and smartphones, which helps shift the nature of instruction towards the 'flipped classroom'. Thus, the learners watch the videos at home and invest classroom time in practicing the material.

However, only a very limited number of studies since the 1990s have examined the impact of using videos in a language-teaching environment, and these were mainly conducted following the advent of the Internet. In 2017, an experimental study was conducted by Pisarenko (2017) to examine the use of self-constructed videos in developing the communicative competence of high school foreign language learners (including different skills, grammar abilities and knowledge, pronunciation and vocabulary, and skills in reading, writing, audition, and speaking). The results revealed a significant improvement in the competence of the experimental group, compared to a control. In a more recent study (Ilyas & Syarif, 2023), the researchers composed videos using the Canva application to teach EFL students, gathering their experiences at the end of the intervention. The results revealed that the students enjoyed learning in this way, and both the students and teachers found this to be an appealing approach to teaching and learning. The students also shared their thoughts that it was easier for them to learn English through videos.

Even though it may be observed throughout the literature that videos are enjoyable study tools, more advanced technology such as artificial intelligence (AI) and chatbots have since evolved. Therefore, this study will investigate the perceptions of undergraduate EFL students, with regard to the use of conventional videos uploaded onto YouTube, specifically the *Follow Me!* TV series for English language learners, which was produced by the BBC and Bayerische Rundfunk in the late 1970s.

## 3. Methodology

This part of the study explains the teaching and data collection procedures, the research tool, and the sampling procedures applied in the current study.

## 3.1 Implementation Process and Data Collection Procedures

This study investigates the use of the *Follow me!* series, available on YouTube, adopting a quasi-experimental approach. The videos selected were designed for Intermediate level English learners and include material such as greetings, personal introductions, and everyday conversations. These videos are around 10 minutes' duration, and the research participants were asked to watch them at their convenience (whenever or wherever they wanted), with no limit on the number of episodes viewed. They would then submit a voice-recorded summary of what they had learned, uploaded to a WhatsApp group.

The study was conducted in August 2024. The researcher posted links to the videos and research tools on the Blackboard account of the selected instructor's class. The recordings were sent to a WhatsApp group that the researcher could access, but without influencing the participants or making them aware of her presence in the group. These recordings were not to exceed two minutes per student, summarizing the main points gleaned from each episode of *Follow Me!*. However, there were no limits imposed on the number of summaries that could

be transmitted to the WhatsApp group over the course of the intervention. Therefore, a student could send just one or several summaries.

Approval to conduct this study was obtained from the Head of the relevant University Department, with no ethical approval required, as there was no risk of harm to any of the participants. Moreover, the researcher was not the participants' instructor, thereby ensuring objective results. Finally, the assignment was not counted as part of the course and was therefore not graded. Pre- and post-electronic surveys were administered using Google Forms to measure the students' motivation levels before and after implementing the videos. Participation was purely voluntary and so the participants had the right to withdraw from the experiment if and whenever they wished.

The students were undertaking an English Listening and Speaking course, as female Intermediate-level undergraduate EFL learners, having passed the standardized language ability test for acceptance by the English Department at the College of Languages and Translation. For the English Listening and Speaking course, they received two weekly sessions with their instructor.



Figure 1: Teaching and Study Procedure

## 3.2 Survey Components

The survey items were adapted from Mhlongo et al. (2021), making them more suitable for the purpose of the current study. In turn, Mhlongo et al. (2021) had developed the scale from Gardner's AMTB model from 1985, which was developed to cover the following domains (Macintyre et al., 2019):

Domain 1: Technology-specific motivational components, related to the use of technology in language classes to develop motivation and a more enjoyable learning environment.

Domain 2: Learner-specific motivational components (self-confidence/anxiety/selfefficacy), amounting to an education setting that reduces anxiety and increases selfefficacy.

Domain 3: Learner-specific motivational components (need for achievement/effort) that include learning a language for a specific purpose.

Domain 4: Course-specific motivational components, meaning that the method of delivering the course instruction is suitable for the learners.

Domain 5: Integrative and instrumental motivational components, which means learning the language for the purpose of achieving specific goals (instrumental) or engaging with the community and culture of the speakers of that foreign language.

## 3.3 Sampling Procedure

To select the sample, convenience sampling was applied, based on the course instructor's consent to help with implementation. The teacher was included after being granted permission by the Head of Department. She held a PhD in TESOL and had been teaching EFL at university level for more than 15 years. However, all the materials used for the experiment in this study were provided by the researcher.

The participating students (n=22) were all registered on an EFL speaking course with the same teacher attending the same section. All of the participants consented to participate in the research survey. The sample consisted of female undergraduates in their first year of study. Therefore, they had three or more years remaining before graduating with a major in English Language from the English Department of a College of Languages and Translation in Saudi Arabia. Their English language level ranged from Intermediate to Upper Intermediate, and they had been required to pass the Standardized Test of English Proficiency (STEP) with a minimum score specified by the Department, prior to acceptance on the English Language degree programme. The Standardized Test of English Proficiency is described by the Saudi Education and Training Evaluation Commission (2024) as:

... similar to other well-known international tests (TOEFL and IELTS) [and] designed in accordance with the Common European Framework of Reference for Languages. [It] targets students who wish to join English language programs in Saudi universities, as well as scholarship programs [and] caters to programs which require a certain level of English language proficiency and individuals who wish to obtain evidence of English language proficiency.

#### 4. Results

This study examines the impact of using videos on EFL learners' motivation to develop their English L2 speaking skills. Accordingly, the current study addresses the following question: *How does using videos impact EFL learners' motivation to develop their speaking skills?* 

A reliability analysis will be conducted in this section, and the results relating to the above question will be presented.

## 4.1 Reliability

Reliability is a very important aspect of selecting a questionnaire instrument. It refers to the degree of consistency or stability found in the research results if the study is conducted with the same respondents on repeated occasions.

To evaluate the reliability of this study, Cronbach's alpha values were calculated for each dimension. Cronbach's alpha ( $\alpha$ ), is the most common estimate of reliability. It is based on inter-correlations between the observed indicator variables and results in values of between 0 and 1, with an acceptable range of between 0.7 and 1.

Table 1: Reliability Analysis				
Items	No. of Items	Cronbach's Alpha		
Domain 1: Technology-specific motivational				
components	8	0.803		
Domain 2: Learner-specific motivational components				
(self-confidence/anxiety/self-efficacy)	12	0.934		
Domain 3: Learner-specific motivational components				
(need for achievement/effort)	8	0.826		
Domain 4: Course-specific motivational components	10	0.872		
Domain 5: Integrative and instrumental motivational				
components	9	0.860		
TOTAL	47	0.966		

The above Table demonstrates that the data passed the reliability test, as the Cronbach's alpha value for the questionnaire was .966 (more than 0.7) and therefore exceeded the acceptable value.

## 4.2 Data Analysis

The Wilcoxon Signed Ranks Test results indicate statistically significant improvements in all motivational domains for EFL learners' speaking skills, after incorporating videos as part of their learning process. The analysis revealed significant differences across various motivational components, including technology-specific motivational components (p=0.017), learner-specific motivational components related to self-confidence (p=0.010), need for achievement (p=0.001), course-specific motivational components (p=0.002), and integrative motivational components (p=0.031). Overall motivation showed the highest statistical significance (p=0.001), with most learners reporting enhanced motivation and confidence in developing their English speaking skills after the intervention.

These findings suggest that using videos as an instructional tool effectively increased the EFL learners' motivation, thereby supporting the success of the programme in encouraging the learners to improve their L2 speaking skills. The programme demonstrated the successful integration of video content, thereby facilitating a more engaging and interactive learning environment, which likely contributed to the learners' increased motivation to enhance their speaking abilities. The following Table presents the participants' opinions, also illustrated in Figure 2.

Comparison	Pank Type	N	Signed Ra	sum of	<u>n–22)</u> 7	n	Ffoot
Comparison	Капк Туре	1	Rank	Ranks		P- Value	Size
Domain 1: Technology- specific motivational components	Negative ranks	5	10.70	53.50		, and	
	Positive ranks	17	11.74	199.50	-2.376	0.017	0.507
Domain 2: Learner-specific	Negative Ranks	5	8.20	41.00			
motivational components (self- confidence/ anxiety/ self-efficacy)	Positive ranks	16	11.88	190.00	-2.593	0.010	0.553
Domain 3: Learner-specific	Negative Ranks	2	1.50	3.00			
motivational components (need for achievement/ effort)	Positive ranks	17	11.00	187.00	-3.709	0.001	0.791
Domain 4: Course-specific	Negative Ranks	3	6.67	20.00			
motivational components	Positive ranks	16	10.63	170.00	-3.025	0.002	0.645
Domain 5: Integrative and	Negative ranks	6	8.92	53.50			
instrumental motivational components	Positive ranks	15	11.83	177.50	-2.161	0.031	0.461
Total	Negative ranks	3	6.00	18.00	_3 574	0 001	0 751
	Positive ranks	19	12.37	235.00	-0.047	0.001	0.731



Figure 2: Mean Ranks From the Wilcoxon Test Results

#### 5. Discussion

From the results, it was identified that the learners developed all domains impacting their motivation based on the theory adopted in this study. The first domain, 'Technology-specific motivational components', related to the influence of technology use on EFL learners' motivation for learning. In this study, YouTube videos were utilized, specifically a TV series called Follow me!, produced in the late 1970s. Positive enhancement was noted pre- and postintervention, ascertained from the participants' responses to this domain. For example, the item, 'The better the kind of English used in the series videos, the more motivated I am to learn English', gained more agreement from the participants after the intervention, improving from 'Agree' to 'Strongly agree'. Meanwhile, responses to the item, 'I really like the English series', improved from 'Disagree' to 'Strongly agree'. This would indicate that modern EFL learners still enjoy using videos in their learning. Thus, they need to be given the freedom to watch them at any convenient time or place, although the video materials should be selected by the instructor to ensure their relevance to learners' needs and language level. This supports the use of videos as an effective technology for learning in the contemporary context. Videos especially support learners' autonomy, which is essential for their language development. This impact of technology is likewise supported by multiple studies in the literature (for example, Lai, 2022; Lengkanawati & Wirza 2021; Warni & Febriawan, 2018).

Regarding the second domain, 'Learner-specific motivational components (self-confidence/anxiety/self-efficacy), which relates to lowering learners' anxiety and raising their self-efficacy, the videos were used in a speaking class as an after-class supplementary tool. The students subsequently described what they had understood via a WhatsApp audio-text. For this domain, the responses to two essential items indicated a change from 'Disagree' to 'Agree', namely, 'I am afraid that other students will laugh at me when I speak English' and 'I find my English WhatsApp group threatening'. This implies that the learners became more confident about their knowledge and were happier to share their thoughts. It has been argued that the use of videos in education improves self-efficacy, but not especially in speaking

classes (Fan, 2022). Therefore, this study contributes to the literature in that it found videos helpful for improving self-efficacy in speaking, which played a role in enhancing learners' motivation.

Regarding the third domain, 'Learner-specific motivational components (need for achievement/effort)', which relates to learning a language for the purpose of completing a course, the teacher's classroom practices were of most relevance, although the teacher played no part in constructing the videos. However, the learners claimed that their teacher supported them by getting them to think independently. For instance, responses to the item, 'My English lecturer encourages me to think independently', changed from 'Agree' to 'Strongly agree' in the post-test. This was largely due to the learners' autonomy to choose the episodes to watch and when to watch them. Autonomy in technology use can support motivation (Isik & Balçikanli, 2020), as in the case of using videos for learning.

Regarding the fourth domain, 'Course-specific motivational components', the delivery of course components and the structure to teach speaking skills (two important items) indicated that the videos potentially enhanced delivery of the course: 'The course helps me to learn other important things not related to language skills' and 'The course design motivates me to learn English.' Both these items show that the videos contributed to motivating different aspects of learning the target language, including the cultural factors conveyed by native speakers of the target language in an authentic environment, wherein videos are necessary for providing such support (López et al., 2021). This helped enhance the learners' motivation to learn, especially while learning how to communicate in English in a foreign country where English was not the native language.

Finally in the fifth domain, 'Integrative and instrumental components', relating to the motivation to learn, a significant development was indicated by responses to the following integrative items: 'It is important for me to know English because one day, I want to become part of a native English-speaking community' and 'I want to learn English so well that it will feel natural to me when I use it.' The responses to this item changed from 'Agree' to 'Strongly agree', indicating the authenticity of the material represented in the videos.

## 6. Conclusion

This study represents an attempt to support the continued use of videos as a learning tool. Despite greater consideration being given to the use of AI and chatbots in language teaching, as a departure from more conventional technologies, social media sites such as YouTube have continued to disseminate and promote the short video instructional format. Moreover, the above platform continues to provide authentic material, enabling an enjoyable experience and enhancing motivation for learning. However, the use of videos must be handled wisely, giving students the choice of when, how, and what to watch, within parameters set by the teacher. For example, it is the teacher's responsibility to select materials that are suitable for the learners' level and needs. Therefore, it is recommended that stakeholders in the language learning sector continue to use such technology, encouraging its inclusion as supporting material for after-class activities and assignments.

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#### Collaboration, Situated Learning, and Citizenship: The Importance of Communities of Practice in a Technical Baking Course

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#### Abstract

Situated Learning Theory considers learning to be socially constructed and grounded in concrete situations, viewing knowledge not as primarily abstract and symbolic but as provisional, mediated, and socially constructed, with intersubjective meanings attributed to shared practices. This study aimed to understand, considering the aforementioned approach, the construction of collaboration as a driver of the learning process in a group of students from a technical baking course, conceived as a community of practice at a technical and technological education institution in southern Brazil. Data were collected through direct observation over a period of four months in 2024, during practical workshops linked to activities that integrate the educational institution with the external community (extension projects). Additionally, semi-structured interviews were conducted with the participating students after the workshops. Based on the collected data, it was possible to identify, at varying degrees, several elements inherent to the genesis of communities of practice presented by the selected theory, such as environment/context, leadership, connectivity, and formal/informal learning. It is worth noting that the participation of these students in the workshops, in addition to consolidating technical knowledge, also enhanced their understanding of the tacit values inherent in food production and their commitment to citizenship, promoting more effective engagement in their professional practices through a more humanized education.

Keywords: Community of Practice, Baking, Technical Education, Extension Projects

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## Introduction

Situated learning and the concept of a community of practice have emerged as transformative ideas in understanding how learning occurs in real-world contexts. Unlike traditional views that often separate learning from the context in which it is applied, situated learning emphasizes that knowledge is inherently tied to activity, culture, and social interaction. Grounded in the work of Lave & Wenger (1991), this approach challenges the notion of knowledge acquisition as a decontextualized, individual process. Instead, it portrays learning as a participatory act deeply embedded in the practices of a specific community.

A key component of situated learning is the community of practice, a group of individuals who share a concern, set of problems, or passion for a particular domain and learn how to improve their practice through regular interaction. Communities of practice provide the social framework within which individuals transition from peripheral participation to full membership, gaining expertise by engaging in shared practices, dialogue, and problemsolving. This dynamic process underscores the social dimensions of learning, highlighting the critical role of collaboration and shared experiences.

The goals of this study are to understand the collaboration of extension workshops in the training of students on the technical course in baking; apply the theory of situated learning; and identify the elements present in the group of students of the technical course in baking that characterize a community of practice.

Through direct observation in workshops and semi-structured interviews, the aim of this study was to understand the role of collaborative interactions between members of the external community, participants in extension projects, and students of the technical course in baking, in the development of social and technical skills. Specifically, the study focuses on the observation of participants and how they managed to organize their informal processes of practice in the real world, learn from others, and produce authentic products in a peer-supported environment. It was noticed that through participation in community activities consisting of workshops related to extension projects, both students and external participants are involved in interactions that promote collaborative and situated learning.

## Methodology

## Context

The federal Institute of RS has 18 units that make up the same Institution, managed by a headquarters called the rectory. At IFRS *campus* Osório there is a Bakery Laboratory, where practical classes and workshops for projects involving people from the community took place this year: people who sell bakery products at family farming fairs in the city of Osório and mothers of children under 3-year-olds participating in a program called Better Early Childhood.

It was in this laboratory, on the practical classes of the technical baking course subjects, that the community of practice exemplified in this study organically emerged. All students (n = 18) on the baking course who started in 2024 were invited to participate in two extension projects, which are actions developed at the institution that involve individuals from the community. Some became interested and started to contribute to these actions as volunteers. Students made the commitment to organize the laboratory, supplies and equipment in

advance, as well as assist in teaching techniques and attitudes of external participants and in cleaning and organizing the space afterwards.

The data collection was realized through direct observation and semi structured interviews. The focus of observations were workshops that connect education, internal and external community. After each workshop, students expressed their impressions and exchanged experiences within the group. Semi structured interviews were applied to organize and systematize their impressions about the collective work they had been developing, as well as the challenges and opportunities they saw.

#### **Results and Discussion**

In baking education, collaboration between students and outside community members fostered a dynamic learning environment where everyone could share diverse perspectives and techniques. This interactive approach not only enhances skill acquisition but also cultivates a sense of community among students and outside community members. Working together allows students to navigate complex concepts, such as the delicate balance of ingredients and baking methods, while encouraging constructive feedback and innovative experimentation. By fostering inclusive discussions during baking workshops, participants can mitigate biases, ensuring that all voices are heard and that learning outcomes are optimized. Ultimately, collaboration enriches both the educational experience in baking education and supports outreach learning spaces, fostering a culture of trust and collective growth that is essential for the development of personal and professional values.

Thus, the main focus of learning is social participation in social communities, building identities, a sense of belonging, shaping what is done and how to be, and interpreting and understanding what is done. As a result, observations during the workshops allowed us to identify the three characteristics that define a community of practice:

- a) It is the result of a collective negotiation process, where relationships of mutual responsibility are built among participants.
- b) It has mutual commitment, where collective effort generates belonging. The practice exists because there are people engaged in actions whose meaning is mutually negotiated. Each participant is an individual with their own identity and the various identities will be interconnected in different ways, and where disagreements can be seen as forms of participation.
- c) It has a shared repertoire of material and symbolic resources that carry the history of the community. Routines, words, stories, tools, ways of doing, gestures, symbols, genres, actions, concepts that the community produced or adopted and that have become part of its practice. The repertoire is the discourse through which members of a community create meaningful statements about the world, the way in which they express their forms of affiliation and identity, the resource for negotiating meanings. This repertoire carries a history of mutual engagement and is ambiguous, which, while hindering change, generates new meanings. Therefore, learning involves participation in practices and the construction of identities from them. The knowledge acquired is the result of the individual's active participation and engagement in the world. Learning implies changes in personal histories, a recontextualization of subjects based on shared routines (Paixão, 2014).

For Wenger (2011), participation is "taking part in something" and the construction of meanings and objectification of experience.

In the interviews, the students expressed a feeling of belonging to a category because they shared typical values of the profession. Words such as quality, standard, commitment and responsibility indicated this stance. Peer collaboration significantly deepens the learning experience, as engagement in teamwork fosters a dynamic environment where workshop participants can exchange knowledge, solve challenges, and refine techniques together. This active learning process aligns with findings that highlight the value of engaging learners in real-world scenarios, allowing them to transfer knowledge into practical contexts (Rodríguez-Luna, 2024). At the same time, as external participants work on tasks collaboratively, they become better equipped to navigate complex decision-making processes. Intertemporal decision-making, such as recognizing when to incorporate ingredients or how to adjust cooking times, illustrates the need to approach tasks collectively; also, studies indicate that individuals often have different perceptions of these critical time-related choices (Fagerholm et al., 2023).

Engagement in educational settings in the laboratory setting can be significantly enhanced through collaborative learning, which fosters deeper interactions among students and between students and other participants. This approach aligns perfectly with the principles of situated learning, as it allows everyone involved in the baking workshop to actively participate in the joint construction of knowledge. By participating in group activities, students not only contribute their perspectives, but also challenge and refine their understanding in real time, reinforcing their commitment to the learning process (Kühn et al., 2023). Furthermore, adopting a reflective stance towards the community can further enhance engagement, that is, when participants perceive their contributions as valuable, a supportive environment conducive to exploration is created (Howell et al., 2021). On that account, collaborative learning not only boosts engagement, but also cultivates an inclusive atmosphere, essential for effective learning and exchange.

Creating an environment where baking students feel a strong sense of community can significantly increase their motivation and learning outcomes. Students in baking technical programs thrive when they engage in collaborative activities that promote teamwork and allow for the sharing of experiences. By cultivating a supportive atmosphere, students can communicate openly and learn from each other's successes and challenges, thereby reinforcing their commitment to their work.

Students learned by practicing together, reinforcing the theory of situated learning; the professional knowledge they developed was not restricted to technique. The identity that is built through doing involves the ethics of care and companionship, elements that add vision to the understanding of oneself, one's profession and one's community. Identity in this case is not a personal and individual elaboration, but rather the result of sharing knowledge and values. It is, in this way, socially constructed. Lave & Wenger's (1991) indications are congruent with what was observed in the technical course in baking. Collaboration between students facilitated the exchange of knowledge and skills (technical and social).

This means that there is no activity in isolation, therefore, activity only exists in a system of relationships where life trajectories, member relationships, and experiences that will lead to social belonging and define the individual are involved (Paixão, 2014). In this way, the subjects in productive practices are historical, situated, concrete, marked by a culture, creators of their consciousnesses that, at the same time, produce and reproduce social reality, while being produced and reproduced by it (Freitas, 1996).

Based on the historical-cultural view, where learning takes place in a social context through historically developed social practices, Wenger (2010) states that activities, tasks, functions, and understandings are parts of a system of relationships where they gain meaning and are socially shared, giving rise to communities of practice. These communities are formed around a specific task that must be carried out by their members, linked by a history and common interests, which makes learning and practice occur simultaneously, which the author calls collective learning. Wenger (2002) explains the community of practice as made up of a group of individuals who share a common enterprise, it is a collective subject capable of learning, which will compose an identity and a sense of belonging, creating a repertoire of symbolic and material resources.

From the interviews it was possible to identify the following key elements of communities of practice: leadership; connectivity; formal/informal learning. Committed to the collective meaning of practice and work, produced with criticality, inventiveness and environmental and social responsibility, students actively seek the interrelationship between popular knowledge and formal knowledge. The construction of identity based on the pillars of knowing how to do things well, the feeling of belonging and the chance of being was confirmed in the semi-structured interviews with the group of students. All of them come from social backgrounds with very different education levels and ages, and stated that the time they spent participating in these practical activities resulted in a new vision of themselves. They said they learned this through work. Professional identity in this case is not a personal and individual elaboration, but rather the result of sharing knowledge and values. It is, consequently, socially constructed.

Students, through collaboration, attributed joint meanings to their experiences and learning. The observations carried out indicate that students learn to care about others. This other reveals itself in different ways: co-workers, equipment, inputs and environment. In all cases, students learn to respect each other. This learning is always experiential, relational. It is not the mere application of principles, but the construction of a professional ethos.

The group of students divided the tasks and talked about each step to be developed. The division of labor imposes the need for cooperation so that the activity is well executed, and everyone involved needs to be responsible. Engagement results in meaning. In this context, meaning is a perception that is almost never translated into words. An example of this is preparing bread dough. As the dough is made, there is a constant experimentation of the consistency via touch. The description of the sweet spot is described by words, but the understanding needs to be confirmed by tactile perceptions. It is not possible to learn without involvement with the raw material being transformed.

Hence, learning emerges from participation in communities of practice (Lave & Wenger, 1991; Wenger, 1998), from social interaction, collaboration and engagement. In short, communities of practice are formed by individuals who engage in a process of collective learning by getting involved in something they do or learn to do together as they interact, producing negotiated meanings, a common repertoire and mutual engagement (Wenger, 1998). Knowledge, for that reason, becomes what is acquired in practice, the result of active participation and engagement in the world.

## Conclusion

Communities of practice represent the moment when people engage in the same practice, sharing what they are experiencing and learning. As a result, they begin to recognize each other as partners, benefiting from mutual experiences, with everyone in the group participating in the same context. The relationship in communities of practice is shared and continuous, in which each member of the group of people also has the entire group to whom they can turn to if necessary, presenting their difficulties and obstacles in order to obtain qualified and guided help, in a path naturally established by the partnerships that arise within the community. Therefore, experiences, mistakes and successes are exchanged, which saves time and energy for the agents, improving quality and allowing new ideas to emerge, especially through the use of tools, such as establishing learning partnerships.

Students' sense of belonging to the course, to the space, to society, expand and consolidate the concept of citizenship. As well as in the preparation of naturally fermented bread, we cannot exactly control the fermentation time and the result of the bread, but we can guarantee the best conditions for fermentation to occur. In a community of practice we have no management over its formation, but we can promote conditions and situations that foster students' engagement in activities related to professional knowledge and practices, as well as the ethics of care and citizenship.

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## Inclusive Leadership Under the Scope of the External School Evaluation Program in Portugal

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#### Abstract

In Portugal, within the scope of New Public Management, school autonomy has been reinforced, and school leaders are being held more accountable for adopting inclusive responses tailored to students' diversity and individual needs. Since 2018, the third cycle of the External School Evaluation Program (PAEE) has been underway, conducted by the Inspectorate-General of Education and Science (IGEC), to verify the implementation of educational policies and promote continuous improvement. This cycle differs from previous ones by, among other aspects, emphasizing teaching and learning processes, incorporating the observation of academic practices, and including in its Reference Framework topics such as "equity" and "inclusion." This study, situated within the interpretative paradigm and of a qualitative nature, aims to understand how inclusion policies are implemented by school leadership through an analysis of reports produced by IGEC and a literature review. Data were processed through content analysis, with the MAXQDA software used to support the evaluation of external assessment reports conducted in 2023/2024, focusing on public nonhigher education institutions in the central region of Portugal. The analysis centered on the "Leadership and Management" domain of the Reference Framework, covering three categories defined by IGEC: i. Obtained ratings; ii. Strengths; iii. Areas for improvement. The results generally highlight the recognition of the work carried out by leadership and management in promoting an inclusive school, with strengths outweighing areas for improvement.

Keywords: External School Evaluation Program, Educational Policies, Inclusive Education, School Leadership, Portugal

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#### Introduction

Since 2018, the central administration and school organizations in Portugal have intensified their commitment to inclusive education to achieve the Sustainable Development Goals of the United Nations' 2030 Agenda. The legal framework for inclusive education<sup>1</sup> calls on school organizations to foster a school culture where all students have equitable opportunities to learn and actively participate in school life regardless of their characteristics.

Inclusive education has become a priority in government policies, embracing an approach that values student diversity. It advocates for teaching methods tailored to each student's individuality, prioritizing differentiated pedagogical strategies. Similarly, it recommends that all students, regardless of their profiles and needs, be educated within the same school environment, promoting inclusion and equity. In this context, all students have been integrated into regular education, including those who require special education support, to ensure access to the curriculum and learning (Lopes & Oliveira, 2021; Sá & Raposo, 2022).

Inclusion is a process that presents significant challenges to school leadership, both at the top and intermediate levels, as it positions the curriculum and the learning of all students at the core of school activities, necessitating profound structural and pedagogical changes (Ainscow, 2020; Bolívar, 2019). According to Lourenço-Gil et al. (2020) and Santos (2019), leadership has shifted its focus to internal factors influencing learning. The director<sup>2</sup> of each school group or standalone school is now seen as responsible for implementing and contextualizing policies defined by the central administration. This includes the responsibility to drive and promote inclusive intermediate leadership that values and respects student diversity, emphasizing the continuous improvement of teaching and learning processes.

Inclusive policies emphasize adapting educational responses to ensure all achieve the Profile of Students upon Completion of Compulsory Education (PASEO). It is the school's responsibility to identify students' barriers to learning and develop "strategies to overcome them," aiming "to ensure that each student has access to the curriculum and learning" (Preamble, Decree-Law no. 54/2018, of July 6).

To monitor the implementation of educational policies and generate improvements, the third cycle of the PAEE has been underway since 2018, directed by the IGEC. It differs from previous cycles by emphasizing teaching and learning processes and valuing the promotion of equity and inclusion for students (Fialho et al., 2020). The introduction of direct observation of educational and teaching practices by a team of evaluators, composed of IGEC inspectors and external experts, who may be higher education teachers or researchers, has been implemented. During this observation, which encompasses different levels of education, attention is focused on pedagogical interaction, the competencies addressed, and the promotion of inclusion for all students (Lopes & Oliveira, 2021; Nogueira et al., 2019).

This study focuses on the third cycle of the External Evaluation Program for Schools (PAEE) due to its emphasis on promoting inclusive education. The objective is to understand how inclusion policies are implemented by school leadership through the analysis of external

<sup>&</sup>lt;sup>1</sup> In English: Decree-Law no. 54/2018, of July 6, amended by Law no. 116/2019, of September 13 | In Portuguese: Decreto-Lei n.º 54/2018, de 6 de julho, alterado pela Lei n.º 116/2019, de 13 de setembro.

<sup>&</sup>lt;sup>2</sup> In Portugal, Decree-Law no. 75/2008, of April 22, with the amendments from Decree-Law no.137/2012, of July 2, highlighted the role of the school director in implementing educational policies and promoting intermediate leadership.

evaluation reports available on the IGEC website concerning public non-higher education institutions evaluated in 2023/2024 in the central region of mainland Portugal. The "Leadership and Management" domain from the Framework of Reference for this Program was prioritized (IGEC, 2023). The defined research question is: "How was the implementation of inclusion policies evaluated by the IGEC in 2023/2024 by school leadership, particularly regarding the classifications obtained, the strengths, and the areas for improvement identified in the PAEE reports?"

The methodology adopted will be described following the presentation of the research question that guides this study and its objective. This section will detail the procedures used, followed by the presentation and subsequent analysis of the collected data. The article concludes with some final considerations, highlighting recommendations from this study and suggesting areas for future research.

## Methodology

This study obtained data through document analysis of external school evaluation reports available on the IGEC website.<sup>3</sup> The selected reports pertained to public non-higher education institutions in the central region of mainland Portugal, evaluated in 2023/2024. Reports related to private and cooperative schools were excluded.

To ensure data protection, the analyzed reports were coded using nomenclature such as E01, E02, and so forth. This procedure aims to maintain the anonymity of the involved institutions and follow ethical standards of confidentiality and privacy in data handling for research.

Based on the interpretative paradigm and following a qualitative approach, a content analysis of the reports was conducted, identifying patterns and trends in the inclusive practices adopted by non-grouped schools and school clusters evaluated. Regarding the Reference Framework of the PAEE (IGEC, 2023), the analysis focused on "Leadership and Management." The content analysis prioritized three a priori categories (Bardin, 2016), which, in this case, were defined by IGEC: i. Obtained ratings; ii. Strengths; and iii. Areas for improvement.

The authors used MAXQDA software to code and organize the data, facilitating the content analysis of the analyzed reports. Patterns and trends in leadership and management practices focused on school inclusion were identified. Specific codes were assigned to each of the three analyzed categories, structuring the interpretation of the data and facilitating the subsequent discussion of the results.

Two independent researchers analyzed the data and performed the coding autonomously. Discrepancies were later discussed in consensus sessions to harmonize interpretations and ensure consistency of the results (Amado, 2017).

In addition to analyzing the documents of the IGEC reports, a literature review was conducted on inclusive leadership practices in Portugal over the past six years. This process allowed for a comparison between the evidence found in the IGEC reports and the theoretical principles discussed in national studies, providing a contextualized view of the observed trends.

<sup>&</sup>lt;sup>3</sup> *Website* da IGEC: https://igec-aee.site/index.php

## Results

According to the data provided on the IGEC website, it was found that in 2023/2024, 21 public institutions of non-higher education in the central region of mainland Portugal were evaluated. An analysis of the reports produced by IGEC revealed that in the area of "Leadership and Management," there were two institutions rated as "Excellent" (E4 and E19), 17 rated as "Very Good" (E01, E02, E03, E05, E06, E07, E08, E09, E10, E11, E12, E14, E15, E16, E17, E18, E21), and two rated as "Good" (E13 and E20). In percentage terms, approximately 81% (n=17) were classified as "Very Good," 9.5% (n=2) as "Good," and an equal percentage and number (n=2) as "Excellent." There were no ratings of "Sufficient" or "Insufficient," which indicates that in all evaluated schools, the strengths outweighed the areas for improvement.

Table 1 summarizes the results of the "Strengths" category, including the defined subcategories of analysis. A brief description of each subcategory and a coded reference to the evaluated educational institutions corresponding to these subcategories are provided.

Defined	Descriptions	Educational
Subcategories	-	Institutions
School Guiding	Clarity and coherence of the documents,	E01, E02, E03, E04,
Documents	particularly the Educational Project.	E05, E06, E10, E11,
	Presentation of the curricular options and their	E12, E13, E14, E17,
	contribution to the development of the	E18, E19, E21
	competency areas outlined in the Student	
	Profile upon Completion of Compulsory	
	Education (PASEO).	
Strategic Vision	Clear definition of the vision that underpins the	All
	school's actions aimed at achieving the PASEO	(E01 to E21)
0 1 1	and the principles of inclusive education.	
School	Coordinated action between leadership and	E02, E03, E04, E05, E04, E05, E07, E08, E00
Leadership	Eague on improving the quality of advantional	E00, E07, E08, E09,
	service and promoting inclusive and innovative	E10, E11, E12, E14, E15 E16 E17 E10
	projects	E13, E10, E17, E19, F21
Continuous	Continuous training for teaching and non-	E04 E10 E11 E19
Training of	teaching staff positively impacting	201, 210, 211, 219
Professionals	pedagogical action and the implementation of	
	diverse measures that promote an inclusive	
	school environment.	
Inclusive School	Promotion of management practices aimed at	E01, E04, E06, E13,
Environment	creating an inclusive, safe, and challenging	E15, E19, E20
	learning environment that fosters commitment	
	and involvement from all in the life of the	
	school.	

#### Table 1: Strengths - Defined Subcategories, Descriptions, and Corresponding Educational Institutions

<sup>&</sup>lt;sup>4</sup> School Leadership: Refers to teachers who hold management positions, namely the Director (top leadership) and Coordinators (intermediate leadership).

Management and Organization of Children and Students	Application of pedagogical criteria in the formation and management of groups/classes.	E04, E10, E19
Management of Physical and Human Resources	Adequate distribution of teaching service and physical spaces, positively influencing the school environment, promoting educational success and inclusion.	E04, E05, E06, E08, E10, E12, E18, E19
Projects	Development of innovative and inclusive activities and projects, impacting the holistic development of children and students.	E02, E03, E04, E07, E09, E11, E12, E14, E16, E17, E19, E20, E21
Partnerships	Diversification of partnerships to address the needs of students, especially those benefiting from support measures for learning and inclusion.	E01, E02, E03, E04, E07, E09, E11, E12, E14, E16, E17, E19, E20, E21

Source: Own elaboration.

Next, Table 2 presents the results of the "Areas for Improvement" category. Similarly, it includes the defined analysis subcategories and a brief description of each and the assessed schools corresponding to those subcategories.

Defined	Descriptions	Educational
Subcategories		Institutions
School Leaderships	Shared responsibility of middle management in improving pedagogical practices and intensifying collaborative work.	E01, E13, E18, E20
Internal and External Communication	Improvement of communication channels with members of the educational community. Provision of relevant information and guiding documents from the school on the website of the educational organization.	E02, E05, E10, E11, E13, E20
Goals for Educational Outcomes	Need to define goals as guiding references for teaching work and the reflection of management, administration, and educational coordination and pedagogical supervision bodies.	E03, E06, E12, E17
School Guiding Documents	Definition of quantifiable goals in the Educational Project, aligned with student performance, to reinforce the coherence of the guiding documents and enhance the monitoring of organizational progress.	E07, E08, E09, E15, E16, E20
Cooperation and Involvement of the Educational Community	Integration of the participation of parents, guardians, and non-teaching staff in the Annual Activity Plan.	E01, E13, E20

Table 2: Areas for Improvement - defined subcategories,	descriptions,	and
corresponding Educational Institutions		

Non-teaching Staff	Implementation of a strategy to encourage recognition of the role of non-teaching staff in the development of the school organization.	E13
Continuous Professional Development	Definition of a Training Plan for teaching and non-teaching staff.	E02, E05, E13, E17, E21
Reorganization of Student Schedules	Need for schedules to include divisions of classes in the subjects of Physical Chemistry and Natural Sciences to enhance experimental work.	E06
Multiculturalism of Students	Appreciation of multiculturalism in internal educational dynamics.	E14
Source: Own elabor	ration	

Source: Own elaboration.

#### Discussion

In Portugal, the Ministry of Education has granted schools greater administrative and curricular autonomy, leading to external school evaluations as part of decentralization and accountability policies (Afonso, 2010; Oliveira, 2017; Ventura, 2006). According to Law no. 31/2002,<sup>5</sup> of December 20, which regulates the evaluation system for education and non-higher teaching in Portugal, the evaluation process requires an integrated and contextualized analysis of the results. In the external evaluation of schools, the results are presented in a report produced by the IGEC for each evaluated school, summarizing the information collected based on a methodology established by the inspection. Methodology<sup>6</sup> is publicly available and was previously communicated to the director of the educational organization being evaluated.

During the analysis of the reports, it was found that in the institutions classified as "Excellent" (E04 and E19), in the domain of Leadership and Management, no areas requiring improvement were identified, with only strengths highlighted. These institutions stand out in all analyzed subcategories, particularly emphasizing innovative practices and results supported by investments in projects and partnerships. School leadership is committed to continuously improving educational services and promoting ongoing training for teaching and non-teaching professionals. Furthermore, they exhibit management practices aimed at creating an inclusive, safe, and challenging learning environment. This finding reinforces the idea that the pedagogical leadership of schools is an essential factor in education development. This topic has become a priority on educational policy agendas at both national and international levels (Bolívar, 2014).

In the 17 institutions classified as "Very Good," strengths predominate in all areas of analysis, with practices and results appearing generalized. In contrast, in the two institutions rated as "Good," strengths outweigh weaknesses in most areas of analysis, although some areas for improvement are identified.

<sup>&</sup>lt;sup>5</sup> In Portuguese, Lei n.º 31/2002, de 20 de dezembro.

<sup>&</sup>lt;sup>6</sup> Methodology described in: https://www.igec.mec.pt/upload/AEE3\_2018/AEE\_3\_Metodologia\_I.pdf
Analyzing the strengths category reveals that school leadership has invested in implementing inclusive policies. The IGEC found in the foundational documents of all evaluated educational institutions under analysis that a vision, mission, and objectives are aligned with the comprehensive development of students and inclusion. There is a clear commitment to fulfilling educational policies and demonstrating practical work regarding the holistic development of students and their preparation for active life, according to what is stipulated in PASEO.<sup>7</sup>

Regarding school leadership, Table 1's analysis shows that, in seventeen institutions, the IGEC identified a coordinated effort between management and middle leadership and a mobilization of the educational community. The actions are directed toward achieving academic goals and objectives, emphasizing improving the quality of educational services and promoting inclusive and innovative projects. However, it is noted that the institutions rated as "Good" (E13 and E20) are not mentioned in this context.

Only four reports (E04, E10, E11, E19), which include those rated as "Excellent" and "Very Good," mention continuous training practices that encompass both teaching and non-teaching staff, are promoted by the organization itself and are aligned with pedagogical needs and priorities.

In seven reports (E01, E04, E06, E13, E15, E19, and E20), the IGEC highlights the school environment as a strength. These reports indicate that a welcoming and inclusive environment has been observed, promoting quality and access to learning for all children and students, including migrants. The analysis of these reports demonstrates that fostering a safe and inclusive environment has been a priority for some school leaders, regardless of whether the rating is "Excellent," "Very Good," or "Good."

The organization of children and students through applying pedagogical criteria in forming and managing groups and classes is mentioned in reports E04, E10, and E19. Additionally, the Inspection identifies effective management of physical and human resources as a strength in eight reports (E04, E05, E06, E08, E10, E12, E18, E19), highlighting its positive impact on the school environment. In the case of report E06, the school spaces are praised for their cleanliness and maintenance of materials, emphasizing that the environment contributes to developing quality teaching and learning processes.

In most schools (E02, E03, E04, E07, E09, E11, E12, E14, E16, E17, E19, E20, E21), participation in inclusive activities and projects is highlighted, positively impacting the holistic development of children and students. Similarly, partnerships with institutions and community agents have been established to mobilize resources and improve the quality of learning. The mention of partnerships is recurrent in various reports (E01, E02, E03, E04, E07, E09, E11, E12, E14, E16, E17, E19, E20, E21) and plays a fundamental role in promoting inclusive education.

The "Areas for Improvement " are more frequent in establishments with a "Good" rating. In reports E01, E13, E18, and E20, middle leadership is recommended to improve pedagogical practices, intensify collaborative work, and manage resources more efficiently.

<sup>&</sup>lt;sup>7</sup> PASEO - Approved by Dispatch No. 6478/2017, of July 26. It can be consulted at:

https://www.dge.mec.pt/sites/default/files/Curriculo/Projeto\_Autonomia\_e\_Flexibilidade/perfil\_dos\_alunos.pdf

According to Table 2, internal and external communication is identified as an area for improvement in six schools. The IGEC notes that relevant information and foundational documents should be available on each educational organization's website.

Regarding academic results, the Inspection advises, in four schools, the establishment of clear goals to guide teaching efforts and foster reflection among leadership and pedagogical structures. Similarly, in establishments E07, E08, E09, E15, E16, and E20, the IGEC recommends enhancing the alignment of the Educational Project with foundational documents and improving the monitoring of organizational progress. In three establishments (E01, E13, and E20), the Annual Activity Plan is suggested to include participation from parents, guardians, and non-teaching staff. It is also recommended that mechanisms for evaluating this Plan be established to focus on the quality and impact of activities on student learning and results.

In report E13, it is proposed that non-teaching staff work be recognized and a strategy to encourage their performance be implemented. Similarly, continuous teaching and non-teaching staff training based on pedagogical needs should be strengthened in establishments E13, E02, E05, E17, and E21.

Finally, in report E06, adjustments to student schedules are suggested to reinforce experimental work, and in E14, the enhancement of multiculturalism in educational practices is encouraged.

The overall analysis of the reports demonstrates a commitment from school leadership to implementing inclusive policies, regardless of the classification achieved. Institutions rated as "Excellent" and "Very Good" stand out for creating inclusive environments, providing ongoing training for professionals, and promoting projects aimed at the holistic development of students. In establishments classified as "Good," more recommendations arise, such as reinforcing collaboration among leadership (both top and intermediate), optimizing resource management, and strengthening collaborative practices.

This study confirms, in line with the arguments presented by Carvalho et al. (2023), that the implementation of inclusive educational policies is associated with school autonomy and how this autonomy is exercised by school leadership. Indeed, leadership is crucial in creating favorable conditions for inclusive and quality education. According to Sá and Sousa-Pereira (2019), directors must promote intermediate leadership that values student diversity and fosters continuous improvement in teaching and learning, contributing to the required equity and inclusive education.

# Conclusion

An analysis of the reports produced by the IGEC regarding the evaluation of public nonhigher education institutions in the central region of Portugal allowed us to address the research question guiding this study: "How was the implementation of inclusion policies evaluated by the IGEC in 2023/2024 by school leadership, particularly concerning the classifications obtained, the strengths, and the areas for improvement identified in the PAEE reports?" The results indicate that in schools classified as "Excellent," leadership demonstrates a sustained commitment to continuous improvement, investing in innovative practices, and fostering an inclusive school environment. According to the Framework of Reference indicators, the IGEC identified only strengths in these schools. In schools classified as "Very Good" and "Good," despite the efforts of leadership to promote inclusion and improve the quality of educational services provided, areas that require enhancement persist, with a more significant number identified in schools rated as "Good."

This study revealed that when made aware of the principles of inclusive education, leadership plays a central role in mobilizing the organization's resources to promote inclusive practices, aiming to prepare all students for future integration into society.

Leadership needs to utilize the IGEC reports as a guide to inform improvements in inclusive practices. This will allow for correcting weaknesses and reinforcing strengths, contributing to creating and sustaining more inclusive educational environments.

As a limitation, it is noteworthy that the results presented depend exclusively on the documentary analysis of external evaluation reports, which may not capture relevant details of inclusive leadership practices in the school context. Additionally, the choice of a single geographic region (central Portugal) limits the generalization of the results to the other areas of the country.

Based on these observations, it is suggested that future research also consider the perceptions of other educational stakeholders, such as students and parents, adopting a longitudinal approach to track the evolution of inclusive practices by school leadership. This approach could provide a more comprehensive view of the challenges and progress in implementing inclusive practices. Additionally, it would be interesting to analyze the implications of the PAEE, particularly in this third evaluation cycle, on the change of inclusive practices in the evaluated educational institutions.

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# Learning With Generative Artificial Intelligence in Collaborative Problem Solving: A Teaching and Learning Framework for Entrepreneurship Education

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#### Abstract

The development of generative Artificial Intelligence (Gen AI) tools has led to different reactions in the field of education arising from both the opportunities and challenges that these tools pose to learning. However, not much is known about how to effectively implement these tools in teaching and learning processes. This study, which followed an action design research methodology, a "learning with Generative AI framework" was developed, implemented, and evaluated in the context of collaborative problem-solving in entrepreneurship education. A literature review was conducted analysing seven articles and two books published between 2022 and 2024. With insights from the T-PACK framework, human-centred design, and human-AI collaboration a framework was built. The evaluation of the framework involved fifteen University of Oulu and Oulu University of Applied Science students participating in a series of Generative AI in Business Processes workshops and three expert evaluators from two universities assessing the framework. Results of this study show that generative AI tools present both challenges and opportunities for learning yet, following a structured approach suggested by the framework, the challenges can be minimised, leveraging the opportunities, to facilitate teaching and learning with generative AI. Creativity, problem-solving, and collaboration can be enhanced by the purposeful integration of generative artificial intelligence tools in teaching and learning. The study concluded that, with human agency remaining central, generative AI tools can be successfully integrated into collaborative problem-solving learning situations in entrepreneurship education using the proposed learning framework.

Keywords: Generative Artificial Intelligence, Collaborative Problem Solving, Entrepreneurship Education, Human-AI Collaboration, AI Literacy

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# Introduction

Generative Artificial Intelligence (Gen AI) has brought new dimensions to education, necessitating innovative approaches to bridge the gap between traditional pedagogical theories and the demands of the future job market. Generative AI can generate content or output such as text, images, audio, simulations, video, and codes (Eke, 2023), so the teaching and learning process needs to evolve to incorporate these technologies.

Although there have been fears around academic integrity issues and achievement of learning goals (Sullivan, et al., 2023), generative AI tools present a transition from technology-based learning to learning with technology (Daia et al., 2023). The former refers to the technology used to support learning to understand concepts while the latter is framed by a cognitive, social-constructivist paradigm where the technology becomes part of the knowledge co-construction process (Niederhauser, 2013).

As the hype associated with the launch of Chat GPT in late 2022 was fading away, questions on how these technologies were to be integrated into teaching and learning processes arose. This study therefore sought to design a learning framework that enhances the integration of generative artificial intelligence in the teaching and learning process without undermining academic integrity and compromising human agency and creativity.

# Literature Review

# Generative Artificial Intelligence in Education

Generative AI is a new form of artificial intelligence that focuses on generating human-like, novel content and data from human prompts producing text, images, audio, video, and multimodal files (Cress & Kimmerle, 2023; Winkler, et al., 2023). Although without any conceptual knowledge or world understanding and can produce information that lacks truth and validity, these tools present a lot of opportunities and challenges to the teaching and learning process. From automated essay scoring to personalised tutoring, research assistance, classroom support, language translation, and skill development, it revolutionises the learning experience, empowering educators, and students alike to thrive in the dynamic landscape of education (Atlas, 2023).

The main challenges with the introduction of generative AI technologies have been concerns regarding the unethical use of these tools, misrepresentation of work by learners, and academic merits without active participation in the learning process. It is for this reason that instead of shunning the usage of these tools, a shift towards embracing generative AI as a contemporary educational technology and integrating it into pedagogical principles is important (Chang, et al., 2023). Collaboration among teachers, instructional designers, education researchers, and AI developers is therefore crucial to spell out the best practices in the utilisation of these emerging technologies.

With the proliferation of these tools, a shift in teaching and learning practices is called upon. Doyle, (2023), suggests that new practices should include "fostering inquiry-driven learning, cultivating critical thinking, enhancing the curriculum with adaptive content and assessment, stimulating creativity and innovation through AI prompts and simulations...." In the problem-solving process, identifying and understanding the problem to develop a relevant and effective solution is key (OECD, 2012) a process that can be expediated using generative

AI tool (Bail, 2023). Generative AI tools can be useful in helping students in inquiry-based learning as they give them access to tonnes of information that is accessible on the go in the digestible format.

Formal training of teachers to integrate generative AI into their practice is critical (Kim et al., 2022). According to OECD, (2023), there is a need to work with educators through experimentation in using generative AI since there is presently no evidence to support learning with generative AI. To benefit from the human-AI collaboration, clear communication from the human factor is particularly important. Educators must be trained to effectively guide the usage of these tools in processes such as asking questions, expressing thoughts, and constructing arguments while interacting with generative AI agents (Vasconcelos & dos Santos, 2023).

In addition, generative AI capabilities are transforming the role of the teacher. Because these tools can offer personalised guidance to individuals in a learning environment, teachers can be very instrumental in bringing relevant personal stories and experiences that may trigger cognitive, metacognitive, and motivational processes among students (Koh, 2023). Therefore, the teacher may use the same AI tools to get guidance ideas for group and individual guidance shifting the role of the teacher from the traditional to the guide-by-side role. With all the potential benefits and challenges that generative AI tools present to the education sector, a balanced approach to its integration into the teaching and learning processes is therefore paramount.

# Collaborative Problem-Solving in the Age of Generative AI

Collaborative problem-solving (CPS) occurs when individuals combine their understanding and efforts to solve a problem (OECD, 2012). It is defined as a coordinated, synchronous activity stemming from a shared problem understanding to co-construct a solution (PISA, 2017). CPS has gained momentum as it equips learners with work-life skills. Ouyang (2023) states that CPS is grounded in Vygotsky's (1978) social and situated perspectives of learning, fostering active learning and triggering interactive, cognitive, behavioural, and socioemotional aspects of learning.

Different dynamics occur during CPS, including interactions among students, between students and groups, and with the learning environment and artefacts (Stahl & Hakkarainen, 2021). The problem-solving process involves clear problem identification (Nelson, 1999), deepening understanding, generating and evaluating potential solutions (Jiang et al., 2023), reaching a consensus, and developing an implementation plan (Chen et al., 2019). This structured approach ensures comprehensive and effective problem resolution.

Social interactions during CPS help develop learners' zone of proximal development. Zhang et al. (2019) suggest that computer-supported CPS may promote collective intelligence and distributed cognition (Stahl & Hakkarainen, 2021). Socio-emotionally, CPS fosters listening, empathy, participation, and cohesive groups, leading to active engagement and social motivation (Ouyang et al., 2023).

Generative AI significantly impacts CPS in learning and work. AI tools, though not conscious, can communicate like humans and be considered true collaborators. Tools like ChatGPT and Bing Chat help develop reflective thinking, creativity, problem-solving skills,

and concept comprehension, fostering engagement and deep understanding (Vasconcelos & dos Santos, 2023).

Different student-AI interactions, including cognitive, socio-emotional, and artefact-mediated types, are crucial in collaborative learning and problem-solving (Stahl & Hakkarainen, 2021). Cognitive interactions focus on task-related knowledge processing, socio-emotional interactions shape the emotional climate, and interfaces play a pivotal role in interaction quality (Vincent-Lancrin & van der Vlier, 2020). These interactions impact learning experiences and outcomes, making AI tools significant co-creators with humans, triggering cognitive, emotional, and motivational states. Beyond human-to-AI interaction, students ask questions, exchange information, and trigger each other's contributions and reflections (Cress & Kimmerle, 2023). Learners using AI tools become active, constructive, and interactive, leading to higher-order learning activities. Collaborative problem-solving involves students and generative AI tools as co-constructors of knowledge and solutions to real-world problems, with AI tools playing a key role as partners in the process.

# Entrepreneurship Education and Generative AI

Entrepreneurship education builds skills like creative thinking, problem-solving, innovation, new product development, negotiation, and leadership (Kuratko, 2005). Effective teaching methods include industry visits, interactive lectures, and ideation activities (Samsudin, 2019). Learning for entrepreneurship involves action-based collaborative learning, with educators acting as facilitators (Kujala et al., 2021). Partnerships with external mentors foster an entrepreneurial mindset (Jackson et al., 2023; Hadley, 2023).

High school entrepreneurship education should focus on experiential learning grounded in 21st-century competencies (Hadley, 2023). Educators should prioritise skill development, value co-creation, and relevant learning environments (Hadley, 2023). Students should focus on skill acquisition, active engagement, and collaborative value creation (Kujala et al., 2021). Less formal settings encourage responsibility, teamwork, and social learning (Hartikainen et al., 2021).

Generative AI tools are useful in various business domains and can aid in the entrepreneurial process (Winkler et al., 2023). However, students should also engage with stakeholders within the entrepreneurship ecosystem (Dermol, 2019).

Entrepreneurship education aligns with collaborative problem-solving, using generative AI tools as partners in generating ideas and creating content.

# Socio-Technical Theory and Generative AI in Education

Socio-technical theory emphasises the interrelation of social and technical factors in organisations (Sony & Naik, 2020). The theory, originating in the 1950s, highlights the importance of humans as resources and encourages collaboration and innovation (Abbas & Michael, 2023). The interaction between social and technical systems leads to organisational success (Walker et al., 2008).

In the context of generative AI, social constructivism emphasises the role of social interaction and collaborative learning (Vygotsky, 1978). Learning is a social activity involving feedback and mentoring (Nelson & Erlandson, 2012). This research integrates generative AI in the

learning process to achieve learning goals through human-to-human and human-to-AI collaboration. The socio-technical theory aligns with design science research methods to optimise the learning process (Cronholm & Gobel, 2022). This research follows the action design research approach, emphasising social and technical collaboration.

# **Research Aim**

This research contributes to the "evolution of education" by providing educators with a blueprint for effectively merging generative AI tools in entrepreneurship education to equip students with collaborative problem-solving and AI literacy skills in the process of "learning with AI" while maintaining sound pedagogical practices.

# **Research Questions**

- a. What are the features of generative AI tools that pose threats and opportunities for teaching and learning?
- b. What components can be included in collaborative problem-solving Learning with Generative AI Framework in entrepreneurship education?
- c. How useful is the proposed learning framework in collaborative problem-solving in entrepreneurship education?

# Methodology

# Action Design Research (ADR) Methodology

This research used action design research (ADR), a subtype of design science research (DSR) popular in information technology (Adam, 2021; Sein et al., 2011). ADR blends design research with action research (Petersson & Lundberg, 2016) to generate prescriptive design knowledge through building and evaluating IT artefacts in organisational settings. It aims to design tangible solutions or artefacts to solve complex problems (Sammon & Nagle, 2023). This method aligns with socio-technical theory and meets the research objectives of integrating generative AI in learning.

# Stage 1: Problem Formulation.

The problem formulation stage involved exploring literature on pedagogical theories, generative AI in education, collaborative problem-solving, and entrepreneurship education. This stage focused on existing knowledge to build a framework for teaching and learning with generative AI (Petersson & Lundberg, 2016). The literature review assessed the potential and challenges of generative AI, emphasising its features and impact on learning (Knopf, 2006).

# Stage 2: Building, Intervention and Evaluation.

This stage involved developing the "Learning with Generative AI" framework, evaluated in real learning settings and through expert evaluation. The framework was applied in entrepreneurship education workshops with 15 participants using various generative AI tools. Data was collected through observations, focus group discussions, artefact analysis, and questionnaires to evaluate the framework's utility, efficacy, and areas for improvement (Venable et al., 2012).

# Stage 3: Reflection and Learning.

Reflection and learning ran parallel to other stages, involving continuous literature review and data analysis. Feedback from participants and expert evaluations was used to improve the framework. The iterative process emphasized the importance of human agency in learning and the non-linear implementation of the framework in real environments (Bilandzic & Venable, 2011).

# Stage 4: Formalisation of Learning.

The final stage involved generalising research outcomes and connecting them with underlying theories. Insights from literature and data analysis were juxtaposed against research questions to determine the applicability of lessons learned in other scenarios. Limitations and areas for future research were highlighted.

#### Participants and Setting

A naturalistic field study was conducted with 15 students (8 females and 7 males) from the University of Oulu and Oulu University of Applied Sciences, selected for their membership in the Oulu Entrepreneurship Society (Creswell, 2009). The natural setting was chosen based on recommendations by Cresswell (2009) and Venable et al. (2012). Evaluation occurred during the deployment phase (Li et al., 2024) through three workshops on business ideation, validation, and pitching, co-facilitated by the researcher and an entrepreneurship educator. Data was collected after each session and the series.

Three expert evaluators in education sciences, business management, and marketing, with experience in teacher training and entrepreneurship education, conducted a second evaluation. Participants were informed about the research process, and participation was voluntary with informed consent. Data was anonymised and later destroyed after the completion of this research.

#### Data Collection and Analysis

The research process was iterative, hence data collection, analysis, and interpretation throughout the process. Qualitative data was collected through literature review, observations, focus group discussions, questionnaires, and reflection notes. Data sets from the different participants were thematically analysed by initially organising and preparing, reading the data, and developing codes before creating themes which were then grouped and interpreted based on the research aim of producing an effective and usable artefact (Creswell, 2009).

# The LASTING IMAGE Framework

This research examined the threats and opportunities of generative AI in education, focusing on building a framework for entrepreneurship education in collaborative problem-solving.

# **Problem Formulation**

To identify the features of generative AI tools that pose threats and opportunities for teaching and learning, recent literature was reviewed. Generative AI offers novel opportunities for personalised, quality learning experiences, addressing educational gaps (OECD, 2023). These tools provide instructional scaffolding and "learning mate" attributes, benefiting both educators and students by offering personalised, 24-hour education (Kim et al., 2022).

Generative AI tools offer significant opportunities for overcoming language barriers and providing high-quality instructional material, especially in remote areas (OECD, 2021; Baskara, 2023). They enable personalised learning experiences, benefiting students from low socio-economic backgrounds and those needing targeted interventions (OECD, 2023). AI tools can enhance human intelligence, fostering creativity and independence (Kim et al., 2022). They also support educators by reducing workload and offering better assessment pathways (Vincent-Lancrin & van der Vlies, 2020).

However, generative AI tools present challenges, such as biases and the potential for producing inaccurate information (Piskopani et al., 2023; Sullivan et al., 2023). Overreliance on these tools can negatively impact students' innovative capacities and collaborative learning (Darvishi et al., 2023). Therefore, careful integration of AI in education is essential to maximise benefits and mitigate risks (Chan, 2023).

A framework was developed to assist teachers in integrating generative AI in collaborative problem-solving within entrepreneurship education. It is based on human-centred design (Giacomin, 2014), collaborative learning (Laal & Laal, 2012), hybrid intelligence (Bredeweg & Kragten, 2022), and the TPACK Framework (Mishra et al., 2023). This framework supports educators in integrating generative AI, considering AI tools as co-members of the learning process.

The framework highlights the teacher's role in integrating generative AI tools, promoting collaborative learning, and leveraging a learning community for entrepreneurship education. Teachers facilitate learning, while students use AI tools in groups, supported by the learning community. The teacher's role includes illustrating AI tool use and providing domain knowledge.



Figure 1: LASTING IMAGE Framework

The acronym LASTING outlines the teacher's responsibilities: learning about AI, assessing tools, selecting appropriate ones, teaching AI literacy, informing students, nurturing AI skills, and guiding students (Davis, 1989; Baylor & Ritchie, 2002; Sharples, 2023; Kolb, 1984; Koehler & Mishra, 2016; Nelson, 2017; An et al., 2022).

The acronym IMAGE represents the student's use of AI tools: ideating, moderating ideas, analysing data, generating content, and evaluating information. Continuous evaluation and peer assessments are crucial for refining ideas and ensuring human agency (William, 2017; Houston, 2020; Hattie & Timperley, 2007; Bason, 2017).

# Implementation Steps.

Teacher: a. *Learn* about and with generative AI. b. *Assess* the best generative AI for your situation. c. *Select* and familiarise yourself with the best tools. d. *Teach* students about AI's pros and cons, privacy, and ethics. e. *Inform* students with domain and contextual knowledge. f. *Nurture* AI literacy and encourage human agency. g. *Guide* students during learning.

Students: a. Use tools for *ideation*. b. Use tools to *moderate* ideas. c. *Analyse* data with tools. d. *Generate* content with tools. e. *Evaluate* problems and solutions with tools and the learning community.

# Framework: Detailed Explanation.

Generative AI redefines teachers' roles from content delivery to facilitating learning and addressing AI literacy (Baskara, 2023; Kali et al., 2015; Nakata & Jarvenoja, 2023). Teachers must *learn* and be AI literate to effectively integrate AI into education (Chaudhry & Kazim, 2021; Cress & Kimmerle, 2023; Kohnke et al., 2023; UNESCO, 2023; Chan, 2023).

Teachers should *assess* AI tools to meet learning needs and goals, considering local needs and ethical use (UNESCO, 2023; Doyle, 2023; Koh et al., 2023; Chan, 2023). *Selecting* the right tools is crucial for effective teaching (dos Santos, 2023; Vasconcelos & dos Santos, 2023). *Teach* students about AI's pros and cons, privacy, and ethics (Kaplan-Rakowski et al., 2023; Baskara, 2023).

Teachers *inform* students about domain knowledge and trends, enhancing critical thinking and effective use of AI tools (Saracho, 2002; Calderon & Cardoso, 2023; Vasconcelos & dos Santos, 2023). *Nurturing* involves personalised mentorship and maintaining personal interactions (Verenikina, 2008; Kohnke et al., 2023; Bulger, 2016; UNESCO, 2023; Koh, 2023).

*Guiding* includes ethical AI usage, privacy, data security, and bias (Bray, 2012; Albadarin et al., 2023; Vasconcelos & dos Santos, 2023). Proper prompting and responsible use are essential for desired outcomes.

In the process of *ideation* generative AI tools can inspire creative thinking by providing novel perspectives during brainstorming sessions (OECD, 2023). Proper prompting helps students frame their ideas effectively. Generative AI can *mediate* during collaborative problemsolving, breaking deadlocks and supporting teamwork (Cress & Kimmerle, 2023; Koh, 2023). It promotes inclusion, equity, and cultural diversity (UNESCO, 2023).

AI tools can *analyse* large amounts of data, saving time and reducing cognitive load (Bail, 2023). They are useful for processing interview notes, questionnaires, and focus group data. Generative AI can *generate* or create text, audio, images, and videos, aiding students in generating materials like interview questions and advertisements without relying on experts.

AI tools can provide an *evaluation* and provide feedback and suggestions, aiding in product validation (OECD, 2023; Doyle, 2023). Human evaluation remains crucial to ensure the quality and relevance of ideas (UNESCO, 2021, 2023).

#### Summary.

For successful AI integration, teachers must adapt by learning and teaching about AI, supporting AI processes, and providing domain knowledge. Generative AI should augment, not replace, human intelligence, with students using AI for brainstorming, moderation, analysis, content creation, and evaluation, while maintaining human oversight.

# Intervention and Evaluation of the LASTING IMAGE Framework

# Framework Testing in a Natural Learning Environment

The initial framework was tested in a natural learning environment with the Oulu Entrepreneurship Society. Data from observations, artefact analysis, focus group discussions, and questionnaires highlighted the need for more domain knowledge and effective use of generative AI tools. Participants, mostly university students, required more AI literacy and prompt engineering skills. Feedback indicated the importance of AI literacy and the supportive role of the learning community. Participants valued the involvement of peers, facilitators, and stakeholders, which enhanced their learning experience and entrepreneurial skills.

# Framework Testing: Experts Evaluation

After initial testing, the framework was adjusted and evaluated by experts in learning sciences, business studies, and marketing. The evaluation focused on theoretical foundations, design, integration of entrepreneurship, generative AI, collaborative problem-solving, usability, and teacher support. Feedback was categorised into themes, highlighting strengths, weaknesses, opportunities, and threats. Expert views were incorporated into the final version of the framework, reflecting the iterative process of development and evaluation.

#### Discussion

#### Reflection and Learning

This research explored the use of generative AI tools to develop students' collaborative problem-solving skills in entrepreneurship education. The "Learning with Generative AI Framework" was evaluated and found to successfully integrate generative AI in teaching entrepreneurship through a collaborative problem-solving model.

The framework's development involved problem formulation, building, implementation, and evaluation, showing that successful integration of generative AI can be achieved through learning about AI, learning from AI, and learning with AI (Kim & Cho, 2022). The first evaluation revealed that learners appreciated using generative AI ethically and gained AI literacy and domain knowledge.

Generative AI tools enabled students to work more efficiently, reducing cognitive load by handling mundane tasks (Sweller, 2011). This allowed students to focus on more complex

tasks, improving their preparation and presentation of pitches. Generative AI provided quick access to information and ideas, enhancing the collaborative problem-solving process (OECD, 2023; Vasconcelos & dos Santos, 2023).

The framework encourages interaction between students and AI tools, promoting coconstruction of knowledge (Cress & Kimmerle, 2023; Kim et al., 2022). It aligns with social constructivist theory, emphasising the importance of interactions in knowledge development (Roth, 2000). Contrary to initial assumptions, the research highlighted the significant, albeit changing, role of the teacher. Generative AI tools transform learning by providing instant feedback and simplifying technical tasks, but human indispensability remains crucial (Koh, 2023).

The framework emphasises AI literacy for both educators and students, highlighting the importance of prompt writing skills (Yilmaz et al., 2023). Teachers must adapt to new roles, collaborating with AI tools to enhance teaching and learning (Mishra et al., 2023). The "Learning with AI" Framework acknowledges the strengths and weaknesses of AI tools and the indispensability of human agency.

# Formalisation of Learning

Generative AI tools present both opportunities and challenges in education. This research shows that with deliberate efforts, these tools can be seamlessly integrated into classrooms without compromising academic integrity. Despite challenges, generative AI tools are becoming integral to work-life, necessitating AI literacy through teacher training and cascading knowledge to students for future skills.

Generative AI tools foster collaboration and personalised learning, boosting learner confidence and outcomes (Wu, 2023; Schunk & DiBenedetto, 2016). They save time and improve efficiency in teaching, supporting diverse learners, including those with special needs (Javid et al., 2023). Proper use of these tools reduces cognitive load, enhancing learning experiences (Gandhi et al., 2023; Ritz et al., 2024).

AI tools provide social interactions and cultural contexts, though biases remain a concern (Morch & Anderson, 2023; Javid et al., 2023). Ethical issues like inaccurate information and biased content must be addressed, but generative AI can support domain-specific learning environments (Su & Yang, 2023). Integrating generative AI in education prepares students for AI-dominated work environments. AI literacy is crucial for teachers and students, requiring ongoing professional development (Kong & Yang, 2024). Misuse of AI tools can undermine critical thinking and creativity, highlighting the need for hybrid intelligence to balance human and AI strengths (Wu, 2023; Doshi & Hauser, 2023; Dellermann et al., 2019; Zhou & Lee, 2023).

# Conclusion

This research highlights the theoretical, methodological, and practical implications of generative AI tools in education. Generative AI presents both challenges, such as ethical concerns, bias, and false information, and opportunities, including content creation, idea generation, analysis, and tutoring. With a structured approach, these tools can enhance learning experiences.

The developed framework, based on generative AI features, proved useful in integrating AI into entrepreneurship education. It employs a human-on-the-loop approach, placing teachers at the forefront and promoting collaborative learning. This framework also supports AI literacy, creativity, and communication skills, showing that AI tools can be co-members in collaborative problem-solving without undermining human agency.

Action design research, grounded in socio-technical theory, was effectively used in this study, demonstrating its applicability in educational research. This interdisciplinary approach can help develop impactful educational solutions. The framework provides a structured method for integrating generative AI in education, maintaining the integrity of learning and emphasising the teacher's role in AI literacy and guidance.

# Ethical Considerations

Ethical considerations were integral to this research, ensuring no harm to participants. The study adhered to guidelines from the Finnish National Board on Research Integrity and the EU General Data Protection Regulation, with necessary approvals and informed consent from participants.

# Limitations and Further Research

This research did not address the long-term cognitive impact of generative AI tools. Further studies are needed on the cognitive effects, motivation, and emotion in learning with AI. Domain-specific AI tools should be developed and evaluated. Additionally, further research on teacher attitudes and student motivation in using generative AI is recommended.

# Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The author used Copilot a generative AI tool to summarise sections of this paper to align with the number of words expected for this conference paper.

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# Re-think, Re-imagine, Re-purpose: A Case Study in Sustainable Use of a Single Material in Design and Technology Lessons

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#### Abstract

In this paper, I will discuss how we developed a series of projects in Design and Technology lessons with boys aged 9–13 using a single batch of donated timber. The wood was used for 2019 iconic temporary pavilion designed by Yinka Ilori and Pricegore architects at the Dulwich Picture Gallery in London. The gallery requested the students design a prototype artefact that could become a community resource. This paper explains how a series of projects evolved from the initial designs. The original artefacts were adapted to different uses and the smaller and smaller offcuts were re-imagined in a variety of different projects across the age groups. This case study offers an example of how a material with a cultural history can motivate projects that value and use the material with care ensuring that nothing goes to waste. It also examines how existing artefacts and offcuts can stimulate unique and exciting creative outputs within a wide range of abilities and ages. It demonstrates the way students learnt to renew and repair weathered material and how using re-purposed materials was embraced.

Keywords: Rethink, Repurpose, Reimagine, Timber, School, Design, Technology, Boys, Education

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# Introduction

I am co-head of Design and Technology at an independent school in South London, where I teach 300 boys aged 8–13. Alongside my teaching, I am completing a practice-based PhD with RMIT University, focusing on material learning and learning by doing. This paper discusses how we used a batch of timber across 3 student projects, integrating sustainability and creativity in design education. This approach emphasizes hands-on learning, collaboration, and creativity, countering a way to educate children out of their creative capabilities, discussed by Sir Ken Robinson in his 2006 TED talk.

Through this case study, I will talk about:

- Where the timber came from and the importance of a material's cultural history in motivating students
- The different outcomes for the timber
- What we learnt about how existing artefacts and offcuts can stimulate unique and exciting projects

# Where the Timber Came From and the Importance of a Material's Cultural History in Motivating Students



Figure 1: The Colour Palace, Dulwich Picture Gallery (Photo by: Adam Scott)

In the summer of 2019, the Dulwich Picture Gallery in South London commissioned designer Yinka Ilori and Pricegore Architects to create a temporary pavilion in their grounds. This pavilion was not just a physical structure but a culturally significant piece, inspired by Ilori's heritage and intended to be accessible, playful, and community centered.

The pavilion design was deeply influenced by Yinka Ilori's Nigerian heritage, particularly the vibrant colours and patterns of Ankara fabric, a Dutch wax print popular in Nigerian culture. This structure symbolized a blend of cultural narratives, aiming to evoke a sense of joy, optimism, and community. So, the pavilion embodied deep values and connections.

After the summer, there was a discussion about what to do with the pavilion. Rather than dispose of the wood, an alternative solution evolved. The students and I were working on a planter design for our school playground in collaboration with alma-nac architects, and they knew the Gallery were looking at how to re-purpose the pavilion. The gallery suggested a proposal - if our students co-designed and constructed a prototype planter, other schools and institutions could use the plans as a community resource. The wood could be shared out

across Lambeth and Southwark schools. By disassembling the pavilion, the wood was detached from its original shape and structure.

During the design and construction of the planters, it was important that the students were aware of the background and the journey of the timber itself as it gave the resource a significance and a value. And the concept of re-cycling is key to Ilori's own approach, as he explains in an interview for "The Modern House":

"What I love about recycling is the narrative aspect of it...So, to something that came from elsewhere, I'm now bringing my British-Nigerian culture, adding value, meaning and stories, extending the narrative. That's what London is about: layers of culture. It's what I love about being British."<sup>1</sup>

Recycling to Ilori is about adapting, combining, re-telling ideas and materials. So, it felt appropriate that we could think about different ways to use and re-use the wood in school.



Figure 2: Adam Shapland From Alma-nac Architects Working with the Students Assembling the Planters (Photo by: Belinda Lawler)

Working closely with Tristan Wigfall and Adam Shapland from alma-nac architects, our Design and Technology students designed and built these modular planters. The students aged 12–13 needed to identify areas of the school grounds that were underused and propose creative ways to enhance them. This process not only engaged their design thinking but also encouraged team collaboration as they constructed site-specific planters. They were repurposing the wood but also the grounds of the school they knew well.

Figure 4 shows Adam Shapland co-constructing the planters, working with the boys, showing and sharing techniques. There is a strict geometry in the design, which was also in the pavilion but in this project the scale and purpose had shifted.

<sup>&</sup>lt;sup>1</sup> The Modern House, (n.d), Artist and designer Yinka Ilori talks colour, identity and designing the 2019 Dulwich pavilion, para. 9.



Figure 3: Garages and a Fortress Made From the Original Planters (Photo by: Melanie Mortimer)

During Covid, the plants in our playground planters died. But, just like the Picture Gallery, I didn't want to dispose of the structures, I also saw the potential to re-think the planters rather than discard them. Post-Covid, the teachers of our younger students mentioned the lack of stimulating play equipment and noted their boys' enthusiasm for small cars. This discussion evolved into another iteration of the wood as we now had a brief and a client. So, we put it to another group of Design and Technology students—could they take the existing planters, recondition them and transform them into garages? As the photograph on the left in Figure 5 shows, platforms, ramps, circular skylights and cantilevered balconies ensued along with a collection of wooden cars, trucks, and caravans.



Figure 4: The Box of Offcuts From the Planter (Photo by: Melanie Mortimer)

However, the element of re-imagining emerged when the garages started to be used by the 6and 7-year-old boys. In Figure 5, the right-hand image shows how the garage has been turned on its side and become a defense, a place to hide, using the bulk and volume of the structure, a place for a person... This is imaginative re-use where the child/children are engaging with the planter, making it a part of their thinking, accommodating and reinforcing its structure to suit their particular situation and intention.

With a growing collection of uniquely shaped offcuts in various stages of weathering, I gave a different age group of boys a brief to make hybrid creatures using at least one piece from the Colour Palace timber. This project encouraged our 9-year-old boys to explore their imagination and capacity for play while working with irregular materials. Drawing inspiration from their favourite animals or fictional creatures, the boys transformed the offcuts into imaginative designs. This referenced the method and outlook of the contemporary design duo, Studiomama, that embrace the concept that "no idea, or scrap material is ever discarded, for dormant within each is another project waiting to be animated, compelling a sense of curiosity."<sup>2</sup> It also gave us a perspective on thinking differently about material we might discard, to quote, "there is a bigger conversation around finding value in everything, including what we deem "waste" and maybe a lot of creative minds can help with that."<sup>3</sup>

This project had several intentions. The boys needed to "follow their fascinations"<sup>4</sup> as Penny Hay, professor of Imagination at Bath Spa urges. But they also had to see these small parts from the Colour Palace as valuable material—in other words, not waste. My aim as their teacher, was to encourage them to see this resource of "scrap" as "standard". This has interesting ramifications.

Because each project produces offcuts, the supply is relatively constant and always changing. The bits left over from other projects are uneven and sometimes rough, but there is a generous supply, and the students could feel free to use plenty of wood for practice. In this way, making mistakes becomes part of the process. As a teacher you are less anxious about the boys making a wonky cut and throwing the pieces in the dustbin, and for the boys, they can 'see' that there is plenty of material for them to use as they gain confidence and skill. The intention is that the workshop environment becomes a really safe space for failure as promoted by the Make First approach at the Crafts Council UK. So, this project was a site for using curiosity, for finding potential in odd-shaped pieces, for tapping into inherent fascinations and for seeing 'scrap' wood as valuable.

One of our teachers gathered the students' reflections on their experiences. The boys could clearly articulate how the project showed their interests in crocodiles, sharks or mythical creatures...Their comments indicated how this motivated them to consider small, key details. The creatures had a physicality in their imagination, and then in their product. It is useful to carefully consider what the boys said in their own words.



Figure 5: The Shiraffe Made by a 9-Year-Old Student (Photo by: Melanie Mortimer)

This student spoke about his interests and the process of trying different techniques to make his creature stable:

<sup>&</sup>lt;sup>2</sup> Studiomama, 2022. p. 9

<sup>&</sup>lt;sup>3</sup> Ibid, p. 121

<sup>&</sup>lt;sup>4</sup> Hay, 2022. para. 3

"I made a Shiraffe. A mixture of a shark and a giraffe. I chose giraffes because I like them, they're really gentle creatures. I like sharks, there are loads of different ones e.g. the Megalodon shark and some that are so small, they're the size of your thumb.

I made a structure. It wasn't strong. It took 2 lessons to do. Colouring took ages. I took off the bit that wasn't strong and pivoted it with nails. I screwed on a different bigger bit which was stronger. When we used the big fret saw you had to look carefully so you didn't cut your fingers. You had to focus too, so you were accurate.

It's been really fun. Today is DT club so I can finish it. I'm excited."

This student clearly harnessed his own fascinations with animals, in particular sharks and giraffes, knowing specific information about their size. But he also articulated the process of learning by doing and how important it was to make mistakes and think through how to solve them.



Figure 6: Off-Cut Creature (Photo by: Melanie Mortimer)

Another student also discusses his trial-and error approach in detail:

"When I was gluing two parts together, they slid about. I was using PVA glue. I used pieces of wood at the front, back and sides to stop it sliding around. The legs needed to be the same length, so they were stable. I used pins to join them to the body so they could lie and stand up. I glued the feet. The tail was in two parts, but one part snapped off. I sanded this bit into a diagonal angle. Then I coloured it.

During that process I added the oak circles. When I was sanding, I touched the wood to see how rough it was. The log circles were harder to sand. I thought what to do as I made it. I didn't have a plan. Before I added the circles I experimented and placed them in different places to see where to put them. There are two eyes on the sides. I added eyes on the front so it could see in all directions. On the end the circle is a mini fan which cools the body down. On the back there is a mirror which reflects air off its head to keep it cool."

His description brings out the physicality of the experience, when he talks about sliding, stability, snapping... He didn't feel hurried, had time to experiment and negotiate. What was also clear was how 'haptic' this learning was, by haptic here I mean it concerns touch, but it is also to do with weight, volume, conditions. And through this material knowledge how you 'know' about textures, rigidity, stickiness and density.

This student could recognise that this making process was organic when he says in paragraph 2, "I thought what to do as I made it, I didn't have a plan...". But he also articulated how the creature had come alive for him, "it could see in all directions", and how it needed a mini fan

and a mirror... The project harnessed innate interests, combining imaginative design ideas with the development of hands-on know-how.

# Conclusion (What We Learnt About How Existing Artefacts and Offcuts Can Stimulate Unique and Exciting Projects)

In this project the concept of "re–purposing/thinking and imagining" has been central—from Ilori's idea of narrative layers, to adapting planters that have been abandoned during COVID-19, and finding ingenious ways to transform odd-shaped offcuts into extraordinary creatures. A bank of offcuts with a history has put some pressure on us as students and as teachers to use it well, to look after it and repair it because it has a 'heritage' which prompts a caring approach. The wood has been somewhere, been part of a something significant which has been admired and used by others.

But there is also a sense of freedom involved. In using 'scrap', wood, (or wood that had been used before), the boys didn't need to feel worried about making mistakes or using plenty of pieces for practice. They had the time and resources to try out different ways of joining and shaping.

They could also use the project as a way of thinking/making, having a go, seeing where things didn't match up to an imaginative concept or didn't 'work' when they tried to construct it, and then trying something different. Seeing the potential in the irregular shapes of the offcuts opened up imaginative possibilities for the boys. They started to see shapes that could link to their own interests. From the interviews, they clearly enjoyed the chance to bring different pieces together, mix them up and make an artefact that had significance.

In their Design and Technology lessons the boys are now very used to seeing donated wood or disassembled pallets as familiar materials for projects. They have learnt to work with the imperfections, irregularities and roughness with impressive care and vigilance. Because the material is not uniform, the outcomes will all be different.

Lastly, I would like to touch on the pedagogy that using second-hand material offers up. Working with offcuts encourages projects that are *open-ended* and *self-directed*, an approach explored by Dr Louisa Penfold from Harvard, in her 2019 paper on a new materialist approach to education. And as she explores, the interaction between student and material is dynamic and complex. It involves minute and well-judged decision-making and continuous adaptation. I would like to conclude with a quote that outlines how this approach can, therefore, be both timely and relevant for 21<sup>st</sup> century creative learning that comes full circle from Robinson's urge to support creative education:

"...materials have the ability to support children in making new connections with themselves, others, and the ever-changing world around them. This framework is important for educators, creative practitioners, and policymakers in shaping education practices, as it raises significant issues around about the importance of the creative arts and materials in children's lives."<sup>5</sup>

<sup>&</sup>lt;sup>5</sup> Penfold, 2019. para. 26

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# International Education: Intersectionality of Teacher Self-Efficacy and Intercultural Competence

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#### Abstract

This study aimed to explore the connections, if any, between teacher self-efficacy and their intercultural competence within an international and mixed ability setting. The research was focused specifically within international school settings due to the potential higher frequency of intercultural populations within these schools. The purpose was to better understand the intersectionality of intercultural competence related to teacher exposures/experiences, such as awareness, knowledge, experience/skills, and attitude towards cultural differences and how that might impact classroom experiences for teachers, and overall school culture. While a subgoal was that through reflexivity, if teacher self-efficacy and the relationship it has with intercultural competence was explored, the self-evaluation of this experience could influence teacher and student experiences, goals, and potential outcomes. With one more subgoal of how researchers/educators can create learning experiences for pre-service teachers in a teacher preparation program to provide more cultural relevance without these future teachers having international teaching experience to prepare them for their future diverse classrooms. The study was completely voluntary for in-service teachers and used using mixed research methods to conduct the study and analyze the data. Researchers used a self-efficacy scale and an intercultural developmental inventory and combined that data with descriptive findings from semi-structured interviews with participants and all data was then analyzed utilizing categorized themes. The results demonstrated a positive correlation between teacher selfefficacy and intercultural competence and yielded themes of not belonging, multiple cultural identities, and expatriate enjoyment.

Keywords: Intercultural, Teacher Self-Efficacy, International Education

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#### Introduction

#### **Background & Purpose**

Culturally responsive teaching continues to stay at the forefront within classroom education. Regardless of students and teachers in person, or not, by understanding their students, teachers have much to gain such as respect, engagement, and improving their classroom community (Gay, 2010). While international schoolteachers not only have the classroom experience, but they also have the cultural experience of living and teaching abroad. International schoolteachers have an advantage to their practice by being encompassed within the environment that some of their students might call home. International schoolteachers are exposed to different languages, customs, religions, traditional foods, mannerisms, etc. By living in a new location and teaching an international population they are constantly raising their awareness, knowledge, experience, skills, and attitude towards difference in general (Huber & Reynolds, 2014). Thus, international schoolteachers were the target population for this study since they would potentially have a higher exposure to several intercultural factors. Many international schoolteachers spend their whole career moving from place to place and living and learning in a new environment to assimilate more cultural experiences. Through this lifestyle of teaching and learning, while also living abroad, these educators are accumulating a diverse set of skills. Thus, the researcher was eager to discover if these cultural exposures did translate to a connection to their belief in their capacity to teach, first and foremost. As a subgoal, how might the process of this research and reflexivity impact them and/or their classrooms and school and a final subgoal, how that might these possible connections of intercultural competence and self-efficacy be harnessed and understood for other educators that were not able/willing to travel and teach internationally to truly display culturally responsive teaching and meet a diversity of needs in their everyday classrooms.

#### **Theoretical Framework**

For the contexts of this research study, several frameworks were utilized: Social Learning Theory and Theory of Learning and Development. First, Bandura's Social Learning Theory highlights the importance of observation and modelling. When one is an international schoolteacher and they are living and working in a location different from their home country, they are exposed to various languages, customs, foods, cultural norms, etc. When learning about these new factors in their lives, they can even mimic these acquired assimilations through attention, repetition, retention, and a general motivation to learn more about the people and places around them (Bandura, 1977).

Bandura also wrote about self-efficacy and how it relates to social learning theory. He stated how it included four sources of influence: mastery experience, vicarious experience, verbal and social persuasion, and physiological/emotional states (Bandura, 1998). While this can be investigated for any one person, by applying these four influences on teachers, one could assess how teacher motivation, behavior, and environment impacts their daily job, educating students. He documents 20 years of research around self-efficacy and summarizes his work by primarily suggesting that if one had a belief in oneself, then that can result in more effective, successful, and overall healthy life, which overlaps into their working world as well (Bandura, 1998).

Vygotsky's Social Development Theory also known as Sociocultural Development Theory, rests on 5 major tenants: social interaction, the more knowledgeable other (MKO), the Zone

of Proximal Development (ZPD), language, and the impact of culture (Vygotsky, 1978). Each of these tenants relate to the context of this study due to the social interactions of a classroom community, school community, and neighborhood community in general. Everyone can be a knowledgeable other to everyone else, since cultural aspects can be taught at any age to another person of any age. Then, with the ZPD where learning occurs with guidance and/or collaboration from others and finally, understanding language and impact of culture in general of other people and the location one lives and works can influence each of the other tenants and how social development might transform learning experiences throughout one's life.

# Methods & Data Sources

# **Research Methods**

This study was completely voluntary for in-service teachers and used mixed methods to conduct the study and analyze the data. Researchers used Tschannen-Moran & Woolfolk Hoy's (2001) Teacher Self-Efficacy Survey (TSES) that consisted of 24 questions to measure teachers' belief in their capacity to teach in relation to efficacy in student engagement, efficacy in instructional strategies, and efficacy in classroom management. The TSES was developed by Tschannen-Moran and Woolfolk Hoy (2001) through numerous revision cycles and testing of hundreds of individuals to generate a final instrument that can accurately identify teacher perspectives in relation to three factors: student engagement, instructional strategies, and classroom management. This assessment tool utilized a 9-point response scale, and the response descriptors ranged from: 1- nothing and going up to 9 - a great deal.

In addition, Bennett, Hammer, and Wiseman 's (2003) Intercultural Development Inventory (IDI) that consisted of 50 questions to measure cultural competence in relation to one's own viewpoint and acquired skills and opinions towards cultural differences and similarities. The IDI was developed by Hammer, Bennett, and Wiseman (2003) and these researchers have tested hundreds of thousands of people from various cultural groups and countries to create a reliable and valid measuring tool. The assessment is offered in 17 different languages through using back translation protocols. This assessment tool utilized a 5-point response scale, and the response descriptors ranged from: disagree, disagree somewhat more than agree, disagree some and agree some, agree somewhat more than disagree, and agree. The IDI is also broken into a continuum called Intercultural Developmental Continuum where there are 5 stages, or orientations in which participants taking this survey can fall within. On this continuum, participants received a perceived orientation (PO), a developmental orientation (DO), and an orientation gap (OG), which was the difference between the PO and DO. The PO (Perceived Orientation) and the DO (Developmental Orientation) scores are determined using formulas that are proprietary (Hammer et al., 2003, Appendix C). Thus, while the algorithm is not available for public knowledge, the data shows participant 'perception' versus 'reality' in terms of their intercultural competence scores and where that score has them fall within the continuum (Hammer et al., 2003). Then, these findings were combined with 10 question semi-structured interviews from the teacher participants and analyzed utilizing categorized themes via MAXODA.

# **Participants**

International schools were selected as research locations for this study due to the potential higher frequency of intercultural competence. The findings in this paper are from three

schools spanning PK-12 in western Europe with 20 teachers who volunteered to be a part of this study. However, this is just one phase of the study, as research is ongoing with other research locations. The requirements for teachers to participate were that they had a minimum of 3 years teaching experience and taught at least in two different international and/or not native country schools. From those that volunteered, they each had at least 10 years teaching experience, with an average of 23 years, they all spoke at least intermediate level in 2 languages, and they had all taught in at least 2 countries.

#### Results

Teacher participants completed the Teacher Self-Efficacy Survey (TSES), the Intercultural Development Inventory (IDI), and the 10-question semi-structured interview for the data collection of this study. However, the results within this paper documents data only up to a certain point as the data collection process is still occurring in other locations.

#### TSES & IDI

The group average results of the TSES were 80.2% out of a total score of 100% self-efficacy. This means that the participants feel that they are confident in their abilities to teach in relation to student engagement, instructional strategies, and classroom management 80.2% of the time they are teaching. Out of the three-category factor analysis, the category that teachers consistently scored higher versus the other two was instructional strategies, averaging 84% and when reflecting on these survey results in the interviews, several participants noted that this was the factor that they had more personal control over since their knowledge base and lesson planning was mostly up to them. Subsequently, student engagement and classroom management required more student participation within their classes, thus depending on others.

As for the group average results of the IDI in terms of perceived orientation (PO) that was 84.3% out of a total of 100% and the group average of the developmental orientation (DO) competence was 69.3% out of a total of 100%. The participants did show to have a slight overestimation of their perception of intercultural competence, but only by 15.0% and still demonstrated a positive correlation between teacher self-efficacy and intercultural competence. Thus, these results demonstrate that these participants fell within the 'acceptance' orientation on the Intercultural Development Continuum, thus comprehending culturally difference deeply and how it impacts daily life. The lower the orientation gap (OG) between the PO and DO, the more realistic your perception is with reality in terms of your intercultural competence. It was mentioned by several participants that the time of day, their disposition, and which cultural identity they were identifying with at the particular time of completing the survey, did impact their results and this is noted as a potential limitation of this study.



Figure 1: TSE & IDI Sample Comparison Data
Highlighted above is a sample of 10 participants from multiple schools to highlight the varying scores. For example, Teacher 2 (T2) experienced slightly lower than average scores of 71% for TSES, and 54% IDI-DO and 85% IDI-PO. Then you see from Teacher 5 (T5) you see slightly elevated scores of TSES of 95% and 65% IDI-DO and 88% IDI-PO. These increases and decreases of scores within their results have similar patterns of connection with a standard deviation of 15.5 and 15.6, thus demonstrating the connection between the scores also.

#### Interviews

Semi-structured interviews consisted of 10 questions and were held via Zoom and recorded with approval for transcription purposes. The teachers were given assessment results approximately 48 hours ahead of time to review and reflect prior to the interview. The interview questions included inquiring about teacher background in terms of degrees, years teaching, languages spoken, describing cultural identity, and then reflecting on the survey results from the TSES and IDI and overall school culture. After analyzing the transcriptions of these interviews utilizing various coding strategies and MAXQDA, the following themes became clear: multiple cultural identities, not belonging, and expatriate enjoyment.

#### Interviews Theme 1: Multiple Cultural Identities.

The first theme identified was multiple cultural identities, which occurred in 100% of the participants. Some of the participants identified with their home country identity and another country in which they lived the longest, while others identified with their current country of residence and where their ancestors came from, even if they had never lived there. While others also identified with a spouse and their home country, if it differed from theirs and where they currently live. While reflecting on the surveys they took, a frequent comment in the transcripts was how the teachers felt like they needed to wear only one 'cultural hat' at a time and couldn't always demonstrate their multiple cultural identities. They noted that it was dependent upon who they were with or where they were (restaurant, school, etc.) if they were to change their demeanor, language used, clothing, etc. One teacher described her cultural identity as a "global citizen" since she identified with so many (D.D., personal communication, 2024).

# Interviews Theme 2: Not Belonging.

The second theme identified was not belonging, which came up in a few different contexts; the first context was when a teacher visited their home country and felt as though they were growing beyond the knowledge/exposure of their home country family members and friends, and the other context was when they first arrived within a new location and having that period of time before assimilation. One participant in particular even cried during the interview noting that when she went back to her hometown, she "felt misalignment after only being abroad for 3 years" (M.L., personal communication, 2024). Thus, with the international teaching lifestyle described by many interviewed, after several years, many moved on to their next location, constantly living in this assimilation state and conveying an idea of never truly feeling 'at home' where they are, and unsure where their 'home' might be.

#### Interviews Theme 3: Expatriate Enjoyment.

The third theme identified from the interviews was expatriate enjoyment and it was a frequent topic of conversation within the interviews as well. Even though some participants struggled with periods of not belonging and having long adjustment periods, they still expressed the joy of living and teaching abroad above the frustration of assimilation to a new location. All participants had lived and worked in at least 2 countries, but several had experience in many more than that and even comparing country to country, each participant was still able to pull positive experiences from each situation and didn't seem to have a negative feeling from living and teaching abroad, especially since they continued to do so. One teacher described it as "getting out of my comfort zone" (CB, personal communication, 2024) and loving the space the grow and learn again and again.

#### **Discussion & Conclusion**

The purpose of this study was to better understand the relationship(s), if any, between selfefficacy and intercultural competence with the assumption that international schoolteachers would have the potential to score higher in terms of intercultural competence survey, thus yielding higher self-efficacy rates. With the context of these three international schools that have completed this study, it did show that they had positive correlation with their TSES and IDI surveys. Then, with the added contextual information from the surveys to aid in the test score analysis, the teachers enjoyed living and teaching abroad, didn't like feeling like they don't belong, thus try to assimilate into the country/culture as soon as they can, and many even identified their current country as part of their cultural identity since they have immersed themselves there. Having these exposures and experiences has seemed to raise their general awareness, knowledge, skills, and attitudes towards cultural differences and it has seemed to impact their classrooms and overall school culture positively since they believe that their capacity to teach in terms of engagement, instruction, and classroom management demonstrated by high scores on their TSES. Through this study, researchers were better able to understand more about how exposure, experience and even immersion of various cultural aspects assisted teachers in feeling confident in their capacity to be culturally relevant classroom leaders.

# **Implications & Significance**

While the results of this study are focusing on international schoolteachers, other schools are currently within the data collection phase and future findings and discussions comparing data are to come. The findings of this study confirmed the hypothesis of the researcher in that those teachers that had exposures/knowledge/experience of other cultures scored higher on an intercultural competence survey, thus scoring with a similar high score on a self-efficacy survey and feeling confident to teach diverse students. A future hope for this continued research and further implications is to harness intercultural skills for others who have varying experiences, especially those who do not have international teaching experience. Furthermore, to that these intercultural skills and create, modify, and implement course content in teacher preparation courses for future teachers as they continue their journey to their future diverse classrooms and to become confident classroom leaders who are culturally responsive to their future students.

# Limitations

As with any study, the sample of participants could limit the outcomes and results of the study, especially with this study only focusing on international teachers. If more participant were included in the study, then the results could have been more statistically significant. In addition, the study only utilized one tool for assessing self-efficacy and one tool for assessing intercultural competence, and both of those tools have their own limitations and reliability factors as they are continuously being improved by their creators. In addition, participant's disposition prior to taking the assessments is a factor of possible limitation as well, as previously mentioned. While the results from this study could have yielded higher intercultural development scores due to international setting and overall cultural experiences with living abroad, teaching abroad, bilingual/multilingual, etc., researchers are currently acquiring data from public school locations in multiple countries to compare international schoolteachers with public school teachers to assist with further implication for teacher preparation programs.

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#### Innovation in Design Education: Decoding Problem Structuring Processes of a Natural Object Driven Open-Ended Étude

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#### Abstract

Literature studies reveal that interpreting the problem-structuring process revolving around wicked problems needs to be explored more. To address this issue, this study aims to analyse students' problem-structuring processes through mixed methods such as quantitative, qualitative, and focus group studies. This is achieved through decoding the synthesis, and comprehension of students' processes and emergent outcomes through diverse perspectives namely, students, intra-rater and inter-raters. The nature-based exercises make small components of the whole for the Basic Design Studio of the first year of undergraduate studies in Architecture at Sathyabama Institute of Science and Technology, Chennai during the academic session from August 2023 to January 2024. Natural object-based exercises can assist in progressive learning and directions to structure open-ended tasks for academicians and give insight to students into their individual processes through reflective thinking methods. This will help design educators frame generative basic design tasks to enhance students' thinking skills, comprehension and synthesis leading to creativity with appropriate reasoning.

Keywords: Problem-Structuring, Mixed Methods Research, Basic Design, Natural Object, Design Education, Design Studio

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#### Introduction

The term "design" is both a noun and a verb. It refers to the mental processes adopted by both individuals and groups to create outcomes with a focus on the framed problem. "Design" firmly grounds diverse domains such as architecture, industrial design, product design, graphic design, interior design, fashion design, etc. To enhance the 'design thinking' among the students pursuing such domains. "visual arts" or "basic design" is offered as a foundation course during the first semester. This develops thinking skills, creativity and diverse abilities such as sketching, painting, colouring, model making etc among the novices. Innovators often turn to nature to get inspiration for designs to achieve a unique product that is efficient and effective.

The design tasks framed as part of basic design or visual arts studio to develop thinking skills and creativity are ill-defined and students face numerous challenges in comprehending as well as finding solutions for the same. According to Parashar, S. (2022), the framed tasks in the foundation revolve around three strategies namely, the traditional strategy, the act of borrowing and deconstruction or decomposition. The conventional strategies focus on the progressive evolution of form while borrowing addresses the license of borrowings from paintings, sculpture and other artifacts. Finally, "deconstruction or decomposition" is about taking a unique path in comprehending something holistically or in a fragmented manner and finding new ways to combine the parts.



Figure 1: Students Working on the Task and Examples of Outcomes

#### **Problem Structuring**

Design is typically a problem-solving activity. Finding solutions to a design task is challenging. According to Restrepo and Christiaans (2004), there is less information about the problem as well as the solution and no directions to the transformation or the structuring process. Simon (1973) has posited that "problem structuring is a process of drawing upon knowledge or external information to compensate for missing information and using it to construct the problem space". Goel and Pirolli (1992) have identified four phases in design problem-solving activity namely, an exploration and decomposition of the problem, an identification of the interconnections among the components, the solution of the subproblems in isolation and the combination of the partial solutions into the problem solution. Interpreting the framed problem,

the ability of the students to focus on the problems and solutions, access to information and timing play significant roles in problem structuring (Restrepo & Christiaans, 2004).

Problem structuring in architecture education is a process that helps students understand a problem before, during and after they start collecting data, modelling, or analysing it. It is the fundamental step in the problem-solving process. Unlike some domains in education, it can not be assumed in architecture and design education that all the relevant issues constraints and goals that constitute the problem are defined in advance or are uncontroversial. In the problem structuring process of a design brief, there is no single uncontested representation of what constitutes the solution. It is against this background, that the authors have attempted to decode the problem structuring adopted by students pursuing architecture in the foundation studio. The framed tasks create a methodology for the students to explore, analyse, interpret, interrogate, induce and express the ideas while evolving, and developing conceptual ideas. (Ramaraj, 2017).

# **Theoretical Background**

Academicians working with the first-year architecture foundation work sometimes select central themes for individual exercises. Natural objects can be selected as the theme and students are encouraged to derive, synthesize and pick from natural objects that are selected as a part of the process. The problem structuring process becomes a major part of the creative process the students undergo. The background study has been taken based on exercises that are Nature-inspired, related to student problem-structuring processes and open-ended tasks in basic design.

Nature-inspired designs help form the basis of design education which subsequently helps in learning about forms and masses in architecture in later semesters (Jebakumar Clifford, 2021). Lin and Liu (2023) argue how nature-inspired design can help students tackle changes in educational cognition, knowledge categories, way of thinking, logic of design, and value of design caused due to technological advancements and artificial intelligence. According to Stevens et al. (2020) research conducted during the Spring semester of Design at The Hague University of Applied Sciences in 2019 showed that students tended to use biomimicry principles more as a hollow concept rather than going through a rigorous in-depth process of understanding and applying the concepts in their design. This meant correct imitation or adaptation of biological strategies and mechanisms into an individual design idea that needed improvement. Journal-keeping steers students toward reflection that leads to the restructuring of their knowledge base which in turn promotes an increasingly theoretical understanding of their metacognitive knowledge (Hargrove, 2012). The open-ended task that was introduced to students started with a journal-keeping process on the individual natural objects. Student psychology plays an important role in tasks. Open-ended tasks show that they help students in various systematic investigations such as "research", "problem", "exploration" and "solution" spaces (Ramaraj, 2024).

# Methodology

According to Creswell et al. (2004) the logic of mixing both quantitative and qualitative data results in visualizing the big picture of a situation through an in-depth analysis. Mixed method research incorporates multiple methods in a systematic manner which revolve around collecting, analyzing, interpreting and reporting both qualitative and quantitative data (Bryman, 2012; Creswell, 2021; Creswell & Plano Clark, 2011). The purpose of mixed-method

research is "to expand and strengthen a study's conclusions" (Schoonenboom & Johnson, 2017). By employing a mixed-methods design, researchers can combine and harmonize diverse data sources, which aids in the exploration of intricate problems that have not yet been studied (Poth & Munce, 2020). In this study, emergent mixed methods as posited by Morse (2009) are adopted sequentially during the study phase to decode the problem structuring processes adopted by novices.



#### **Participants**

As part of the basic design studio (Design studio I, SARA9102), the task was framed. Thirtythree students (17 girls and 16 boys; average age 18.3 years) pursuing architecture at the Department of Architecture, Sathyabama Institute of Science and Technology, Chennai during the academic session, August to December 2024 participated voluntarily. For the evaluation process, five skilled assessors (1 male and four females; average age, 35.4 years) with an average experience of 9.4 years in teaching participated voluntarily. Among these skilled assessors, two members planned, organized, conducted and successfully conducted the basic design studio.

# **Data Collection and Analysis**

The study is conducted in four phases as shown in Table 1. The first phase revolved around the identification of unique outcomes based on the shared views of the design studio team. Among the thirty-three emergent outcomes, fifteen models as shown in Figure 1 were selected for an in-depth study. The second phase revolves around the design processes and the outcomes of a basic design task that revolves around generating a 3D model with inspirations drawn from a natural object. During this phase, two intra-raters (2 females; average age, 35.5 years) shortlisted fifteen models for further study. According to Viera and Garrett (2005), the value of Cohen's kappa more than 0.61 depicts substantial agreement. The relationship between the emergent models as well as the natural object was observed by two intra-raters (2 females; average age, 35.5 years) and an inter-rater (1 female, 35 years) on a dichotomous scale to determine Cohen's kappa.

Table 1: An Insight into the Four Phases Adopted for Data Collection and Analysis					
Phase I	Identification of the models for an in-depth study to decode the problem				
	structuring process				
Phase II	Relationship between the emergent models as well as the natural object				
	using Cohen's kappa				
Phase III	Pearson's correlation coefficient to determining the relationship between				
	the total creativity and the parameters identified for decoding the problem				
	structuring process				
Phase IV	Decoding and mapping the problem structuring process				

The shortlisted models were evaluated with a focus on profiles, experimentation with ideas and materials, and inherent quality with a thrust on the natural object identified by the students on a five-point Likert scale by five inter-raters. For the assessors, the image with both the outcome and the source inspiration was shown twice, firstly to rate and secondly to confirm the rating. Besides, total creativity was measured on a twelve-point scale, primarily to overcome the degree of biased evaluation. The total creativity was evaluated by an inter-rater (1 female, 35 years) who has ten years of experience in teaching as well as in conducting a basic design studio. The scores obtained on the twelve-point scale were converted into a five-point scale from one to five representing 'strongly disagree', 'disagree', 'neutral', 'agree' and 'strongly agree'. Pearson's coefficient was determined between the calculated fifteen mean values and the respective overall impression scores to examine the type of correlation. These parameters were mapped hierarchically to decode how the students had drawn inspiration from the natural object to evolve ideas for the 3D models.



Table 2: Identified Outcomes and the Source of Inspiration

# Findings

Cohen's kappa is calculated from five questions on the aspects such as experimentation with materials, ideas, inherent quality, modules and layers collected from both intra-rater and interrater is 0.71. This value shows a substantial agreement among the raters which indicates that the identified aspects for decoding the problem structuring process are appropriate. Pearson's coefficient was calculated for the identified aspects in two ways. Firstly, between the total creativity and the mean score of the four intra-raters and secondly between the inter-rater and total creativity. The calculated coefficients are shown in Table 3. The values obtained to check the degree of agreement between the total creativity and the intra-rater depict moderate relationships for all the identified aspects. Concerning total creativity and inter-rater, the values depict a strong relationship for inherent quality, experimentation with ideas and modules; and moderate concerning the experimentation with ideas. However, the value obtained for the aspect 'layers' depicts a weak relationship.

Aspects		Intra-rat	ter (5 nos.)	Inter-rater (1 no.)		
		Coefficient	Relationship	Coefficient	Relationship	
Experimentation	Materials	0.55	Moderate	0.58	Moderate	
	Ideas	0.54		0.68	Strong	
Inherent quality		0.57		0.79		
Modules		0.58		0.68		
Layers		0.53		0.46	Weak	

The process adopted in all the thirty-three emergent outcomes was decoded in association with the source of inspiration by the two intra-raters who handled the design studio. The processes were decoded and interpreted as 'rationales'. Three rationales were interpreted as shown in Table 4 and the students had predominantly adopted a 'metaphoric approach' and classified as tangible as well as combined metaphors as posited by (Antoniades, 1992). Three rationales such as A, B and C were interpreted. Rationally A focuses on the overall profile to generate modules that were either scaled up or scaled down to create a form. When the cross-sectional or longitudinal profiles serve as the source of inspiration to create a form, it is identified as Rationale B. Rationale C revolves around deriving a profile from a part of the natural element to create modules and forms incorporating an inherent quality.



Figure 3: Mapping the Problem Structuring Process

Among the thirty-three outcomes, around eighty per cent of the outcomes fall under tangible metaphors. Concerning the outcomes identified for an in-depth study to decode the problem structuring process around 40% were classified as combined metaphors.

Table 4. Interpreted Rationales and Classification of the Emergent Outcomes								
<b>Rationales Interpreted After</b>	Metaphoric	Number of Emergent Outcomes						
Decoding the 33 Emergent	Approach	33		15				
Outcomes		Nos.	%	Nos.	%			
Rationale A: Overall profile (positive / negative) + Module+		Fourteen	42.42	Four	26.66			
scaled up/scaled down + Massing								
Rationale B: Profile derived from cross section or longitudinal section + Scale up/Scale down to generate modules + Massing + layers	Tangible Metaphor	Twelve	36.37	Five	33.34			
Rationale C: Profile derived from the cross section or longitudinal section of a part derived from the natural element + Scale up/Scale down to generate modules + Massing + layers + Inherent quality	Combined metaphor (Tangible & intangible)	Seven	21.21	Six	40			

 Table 4: Interpreted Rationales and Classification of the Emergent Outcomes

#### Conclusion

The processes decoded to interpret the problem structuring process were mapped as shown in Figure 2 to construct the different processes adopted by the novices to create a model drawing inspirations from the natural element selected. It was observed that the models incorporating two or three layers incorporating inherent quality were unique. Such outcomes displayed that the problem structuring process adopted by respective novices was firmly rooted in the natural elements from which they had drawn inspiration. Besides, the nature journal which was introduced at the beginning of this task facilitated them to comprehend and interpret the diverse properties visually as was sensorially. The students were able to incorporate the ordering principles, and continuous experiments with ideas and materials along with the suggestions and comments were given by the design faculty enabling them to think out of the box to create metaphoric three-dimensional forms.

#### **Future Directions**

Exploring the problem structuring process will also help faculty members frame tasks that are challenging and unique in nature. A longitudinal study of the problem structuring process for an open-ended task will give an insight into how creativity and thinking processes change concerning time. Besides, taking inspiration from natural elements in architectural design studios offered in higher semesters can also be explored to comprehend the principles of 'bios' in architecture with a thrust on biomorphism, biomimetics, biophilic etc.

The methodology adopted in this study can be extended to other open-ended tasks in basic design studios or foundation studios which are offered in diverse domains such as fashion design, product design, interior design, visual communication, animation etc. A comparison of the problem-structuring process of students to an AI-generated algorithm is a possible pathway to a future of education in design.

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# Are AI-Powered Chatbots Helpful in Teacher Training? Pre-service Teachers' Perspective

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#### Abstract

In recent years, there has been a noticeable increase in interest in the use of AI-powered chatbots and AI tools in academic contexts. This study examined preservice teachers' perceptions to explore the opportunities and challenges of AI-powered chatbots in teacher training. The study was conducted in Finland's higher education universities, and twelve faculty members participated in the semi-structured qualitative interviews. Thematic content analysis was used to analyze participants' responses. The results showed a wide range of opportunities for AI-powered chatbots as learning assistants, language, text, efficiency, as well as productivity enhancement, and pointed out challenges such as adapting to AI, reliability issues, educational impact, evaluation, and ethical challenges. The implications of the findings highlight how AI chatbots might be integrated into teacher training programs for both students and teachers. Thus, future research directions include examining and comparing the impacts and barriers of implementing AI chatbots in teaching and learning.

Keywords: AI Chatbots, Artificial Intelligence, Teacher Training, ChatGPT, AIED

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# Introduction

Recent advances in AI have accelerated a rising curiosity regarding artificial intelligence's (AI) possible uses and consequences, in different socio contexts, including across education (Sallam, 2023). The attention was sped up by the publishing of an AI-powered chatbot, ChatGPT, published by OpenAI, which attracted millions of users within a few days (Biswas, 2023). The diversified uses and potentiality of this AI-powered chatbot have led to crucial debates leading researchers to suggest that this innovation will bring paradigmatic change to education (Bozkurt, 2023), while others argued about the ethical challenges of this kind of technology (Sardana et al., 2023). As there are already some similar types of chatbots like Bard, Ernie, and Bing Chat (Rudolph et al., 2023b), it is crucial to thoroughly assess their potential opportunities and drawbacks.

Initial studies emphasize the opportunities of ChatGPT for education purposes (Liebermen, 2023; Zhai, 2022). Zhai (2022) conducted a study that piloted the use of ChatGPT to write an academic paper where the findings suggested that ChatGPT can assist researchers with literature review, necessary information, and efficient writing. In parallel, Liebermen (2023) suggested some guidance to implement ChatGPT for students such as utilizing the technology as a tool to investigate the potential and constraints of online information sources and knowing the fundamentals of how it functions. However, it is unclear if ChatGPT will alleviate or exacerbate the concerns raised by earlier chatbots. Therefore, a more advanced chatbot like ChatGPT needs a more thorough investigation in the education context.

There was a case when ChatGPT was banned from educational networks by Los Angeles Unified Schools, Baltimore and New York City (Shen-Berro, 2023; The Guardian, 2023). The reason for the banning is explained as ChatGPT provides students with an "easy out" by allowing them to input prompts and use machine learning to generate answers. Teachers and officials from schools also perceived ChatGPT as a risk to students' growth in writing and critical thinking skills (Reuters, 2023). However, this may result in a significant and immediate defensive response to the potential opportunities. Therefore, to ensure safe use, it is crucial to investigate the possible opportunities and challenges of using AI-powered chatbots in teaching-learning. This study focused on exploring the possible opportunities and challenges in teacher training from a university teacher's perspective. The overall aim of the study was to contribute to the education sector by empirical findings of opportunities and drawbacks of AI-powered chatbots from the pre-service teacher's perspective. This will also add to the literature by highlighting innovative ways in which chatbots can be integrated into teacher education and other faculties and how chatbot features and interactions can overcome challenges and have a positive impact on both the teaching process and learning outcomes.

The present study answers two primary research questions:

- 1. What are the challenges pre-service teachers are experiencing regarding AI-powered chatbots?
- 2. What are the possible opportunities of AI chatbots in teacher training?

# **Theoretical Framework**

In light of constructivism theory, recent research such as Ulla, Perales, and Busbus (2023) and Rasul and colleagues (2023) employed content analysis in their review work. Rasul and colleagues (2023) identified five important benefits and also five challenges addressed by experienced practitioners for which they also suggested propositions. Constructivism learning

theory served as a framework for explaining how technology might be used for personalized, active, and collaborative learning in higher education. In line with this, the current study selected constructive learning theory as a framework to explore the opportunities and challenges of AI-powered chatbots in teacher education.

However, the thing that set this study apart from the others is that it wasn't a literature review; instead, it involved in-person interviews with university teachers who are both active in teacher training and developing AI-related policy. Interviews and constructivism are related because they both place a strong focus on comprehending people's subjective experiences and viewpoints. The constructivist theory emphasizes the significance of individual meaning-making in the learning process by arguing that knowledge is created via interactions with the environment and social situations. This is in line with qualitative research techniques like interviews, which aim to capture participants' complex perspectives (Byrne, 2001; Rasul et al., 2023). Interviews can also able to reveal how teachers and students use AI chatbots to shape their knowledge and learning by offering rich data that can be used to adjust educational practices, including the integration of AI tools, to better promote learner engagement and development within a constructivist framework in teacher training.

# Methodology

The study is rooted in a qualitative and exploratory research design and has employed individual interviews as the sole method for constructing data on teachers' perceptions. For exploring teachers' perceptions, this study chose the thematic analysis of the interviews. A semi-structured questionnaire for key informative interviews (KII) was developed to collect the data with open-ended endings like why and how to explore the opportunities and challenges of AI-powered chatbots from teachers' perspectives. The questions asked to the participants was about their perception of AI and AI-powered chatbot, their experience in using the chatbots, how they find it useful in their teaching strategy and what could be the possible challenges in integration in teacher training. The participants of this study were the faculty members connected to disciplines in teacher education training at higher education universities in Finland. Participants were chosen based on purposive sampling. The criteria include who are teaching pre-service teachers in the degree program of teacher education and are possibly aware of the diversified uses of Artificial Intelligence.

After preparing the transcript from the interviews the data was coded for the analysis. The coding process includes five steps. Firstly, every interview transcript had gone through an open coding process. The entire text was carefully read through word by word to develop open codes. For example, from the text "*I think they are capable of synthesizing large amounts of data, so that's their largest strength, it manages to inform you about something in a very synthetic way, even if it's a complex phenomenon,*" the code retrieved was "make complex idea simple", "synthesizing large data" "inform synthetically." Following the open codes out of the data supported by the software ATLAS.ti. A new code was added to any data that did not fit into the preexisting preliminary codes. The next two steps include data coding and revising codes. Similar codes were combined into a single category. Finally, categories were revised to be placed in broader categories and finalized into main themes based on the research questions.

#### **Findings and Discussion**

The data exhibit pre-service teachers' perception of the challenges and opportunities of AIpowered chatbots in teacher training. Five themes emerged from the data that represent the challenges, and six themes represent the opportunities of AI chatbots in teacher training.

#### Challenges of AI Chatbots

Interviewees voiced concerns over the difficulties associated with implementing AI chatbots in teacher training. From their discussion, five themes emerged as challenges they are experiencing regarding AI chatbots in teacher training.

#### **Reliability and Concerns**

Every participant expressed apprehension about the way in which the dependability of AI chatbots is called into question. Since it withholds the source, the text cannot be trusted. There are instances where ChatGPT provides incorrect references as well.

"It gives you citations or references, but most of the time they say those references are not correct actually."

The challenges of "writing a good prompt" and giving "repetitive instructions" to AI chatbots like ChatGPT were also brought up by the participants. All the interviewees acknowledged that they need to always double-check the language to ensure the meaning is expressed correctly. Participants also expressed concerns about students' privacy and their improper usage of AI for various purposes.

# Adaptation With AI Tools

One of the most significant challenges noted by the participants was the challenges regarding adaptation to AI tools. According to the participants' statement, the three primary barriers to adopting AI tools are time requirements, teachers' negative attitudes, and "affordance."

The participants indicated that "it is more work" and "further preparation" is needed for embracing AI. They emphasized that there are so many AI tools for education now and it is also a challenge to select one and how to use it. Along with that, the participants also addressed the preparedness and attitude of teachers toward AI tools as a crucial obstruction. Out of the twelve ten participants expressed a lack of preparation and negative attitudes towards AI tools in the teacher training program. Some described it as "scared to use," "fear of replacing teachers," "not enough literature," "not trained enough" and "uneagerness."

"Well, I have some colleagues that they are even more interested about AI than myself, and when they bring up the AI in every discussion, I can see some of the colleagues are rolling their eyes and saying oh no, not again."

# Threat to Learning and Skill Development

One more crucial challenge identified by the participants was skepticism about students' learning and their capacity for skill development. All the participants raised concerns about the educational impact of AI tools. The inhibition of cognitive functions was the main issue

discussed. "Higher order skills" like "problem-solving," "critical thinking," "argumentative skills," and creative writing are being suppressed, and this is concerning. Participants also mentioned AI chatbots as "risk for learning," "easy way to get answers" "not substitution of creativity."

#### Challenges in Assessment and Evaluation

All the participants expressed challenges in evaluating academic texts. They noted that unrecognized textual sources and students' unethical applications are concerning. Additionally, they asserted how difficult it is to distinguish between students' texts and texts produced by AI. Participants also pointed out the difficulties of not having plagiarism detection for AI texts. Additionally, one participant brought up the lack of plagiarism detectors for the Finnish language,

"Well, at the moment we don't have any system that detects plagiarism of AI, and those we have don't detect very well, especially we don't have it in Finnish."

#### Ethical Challenges

All the participants raised their concerns about ethical issues. One of the most important challenges brought up by the participants was the privacy issues with the AI tools. Participants clarified that almost all of the AI tools are for commercial use and personal information is required for login purposes. AI chatbots are still external tools in some universities, and students must use caution when providing the chatbots with personal data. According to pre-service teachers, the university's policies and guidelines are somewhat ambiguous. The issue with the policy is that the allowable percentages of artificial intelligence are not properly mentioned.

"And that area has no particular guidelines there like to what extent, what percentage can be written by AI or not, and then who do you award the degree to at the end of the day."



Figure 1: Challenges of AI Chatbots in Teacher Training

The concerns about lacking creativity, ethical challenges, and challenges in evaluation are supported by Rudolph and colleagues (2023) and Rasul and fellows (2023). The participants mentioned that AI chatbots lack creativity, often deliver incorrect references, and don't reveal sources. The statements are congruent with Rasul et al. (2023) who indicated that the inaccuracy of the information that ChatGPT's technology frequently delivers and the inadequacy to assess and enhance graduate skill sets are some significant problems. Rudolph et al., (2023) also expressed concerns regarding assessment and evaluation because AIgenerated answers could outdate traditional approaches. The study was a literature review with selected articles, however, participants of the present study reported similar findings regarding teacher training. In addition, our participants expressed concerns about the time required to adjust to new technology, discouraging teacher trainees from adopting new educational tools. This anxiety highlights the difficulties associated with incorporating technology into educational processes, as the perceived time burden may lead to reluctance among educators already dealing with the complexities of their training. Addressing these concerns is critical to creating a more favorable environment for technology adoption in teacher education programs.

In the study, Rasul and colleagues (2023) also mentioned that graduate-level skills like critical thinking, problem-solving, cooperation, and teamwork require social interactions, contextual inputs, and real-world experiences—all of which ChatGPT cannot fully provide. The pre-service teachers also mentioned that AI chatbots suppressed cognitive functions and argumentative writing still requires students' active efforts. However, when some countries like Italy, and the United States are banning ChatGPT from educational institutions (Browne, 2023); Ogugua and colleagues (2023) mentioned that ChatGPT has both positive and negative effects and suggested some effective ways to integrate ChatGPT in educational settings.

They mentioned defining the specific goals and objectives to be achieved using ChatGPT in classes, establishing clear guidelines and boundaries for using ChatGPT; and emphasizing the importance of critical thinking and independent problem-solving skills with ChatGPT. The findings are similar to the opinion of the preservice teachers while the proposal of including AI chatbots indicated not only ChatGPT but also any available registered chatbots for teachers and future teachers from the IT department of the university. In addition, the data also reflects the concerns about students' plagiarism where preservice teachers are in dilemma about the educational impact of these AI chatbots. Participants suggested clear guidelines about the percentages and declaration of using AI chatbots for both teachers and students. According to Tate and colleagues (2023), preservice education is needed to provide the necessary pedagogical information and practical skills to incorporate AI in their lessons. Thus, there is a need to learn more about the benefits and drawbacks of AI chatbots, foster a more positive attitude towards integrating AI tools in teaching-learning, and consequently digital competency in teacher training programs.

# **Opportunities of AI Chatbots**

Based on the experience of using AI-powered chatbot, each participant outlined several opportunities. This thematic category is composed of six central ideas (Figure 2). In the following sections, each of the sub-themes is explained in detail to assist with illustrating the concepts underpinning this topic.

# Learning Assistant

Most of the participants perceived AI-powered chatbots as a learning assistant for students. Some participants suggested AI tools as guidance and support and others pointed it as a friend to assist in learning. Then, participants also suggested some forms of learning where using AI tools will mostly benefit students, such as "learning a second language," "vocabulary learning," "generating thesis ideas," "template for presentation" and so on.

All the participants recognized that AI chatbots like Chat GPT are "full of resources" and summarize things with "very good text," so both teachers and students can use it to learn new topics and generate different sorts of knowledge. Regarding the potential of AI in students' learning, participants share an understanding that by helping students to summarise large amounts of text into small pieces and quickly access information, AI increases their productivity and efficiency in learning processes. It is noticeable that the idea of productivity linked to optimizing time becomes an asset of AI.

# Transformation of Teaching Strategies

During the discussion about the possibilities of using AI tools in education, the pre-service teachers pointed out several opportunities to transform their regular teaching materials into technology-enhanced ones. In their opinion, AI tools can be used both in planning and preparing teaching materials. In terms of classroom activities, participants also specified some tasks where AI-powered chatbots can be utilized effectively, for example, creating "visual material images," "pictures for slides," "games for courses," "videos for contents." Participants stated:

"If I'm making some sort of images, for example for PowerPoint presentations, it's more likely that I try to make them fit AI like ChatGPT, Dall-E or Adobe projects and so on."

Another important issue discussed during the interviews was the ways of formulating assessment exams in a way that students can't use AI to directly answer the questions. For instance, participants suggested that teachers could plan the assignments and then ask AI for the answer for them and then make some changes to the assignments so that AI doesn't give the straight answer to the question.

#### Efficiency and Productivity Enhancement

Participants acknowledged that employing AI in the workplace is clearly advantageous regarding working hours and accessing information. Yet, selecting the right instance of use and executing AI impeccably in the workplace may lead to even greater benefits.

# Language and Text Enhancement

Each participant explained how AI-powered chatbots enhance students' and teachers' use of written texts. Four participants assured that the text provided by language-based popular AI like ChatGPT is "clear," "good," "improved" and "well-developed" and mostly they are using it to simplify texts. Furthermore, it has been noted that students use ChatGPT to improve their written tasks like "reviewing and summarizing articles" and writing text in different ways.

#### Data Optimization and Analysis

Among twelve participants, six participants mentioned the possibilities of AI tools as for data optimization and analysis. For instance:

"I would include AI only when there is a need for optimizing some sort of data for understanding very specific concepts in a variety of fields. So, for example, when there is a need for optimizing this search, optimizing this gathering of information, I think AI could be used."

AI tools, therefore, offer the opportunity to be integrated into teacher training in the form of optimizing data since it can classify data based on specific attributes and predict solutions quickly.

#### Fascinating Factors of AI Chatbots

During the discussion regarding the rationale behind using AI tools, participants acknowledged that they began using ChatGPT and other AI tools out of "curiosity," "interest" and so on. Also, information about ChatGPT was "available both online and in newspapers." Again, most of the participants also agreed that AI has a "vast field" and its limit is "boundless" and "possibly a big societal and global change." The language-based AI model ChatGPT was notably brought up by participants, by pointing out how "popular," "easy to learn," and "usable for average people" it is, making it accessible to all users and occasionally even able to "substitute human in some fields."

In summary, when discussing the potential applications of AI-powered chatbots for teacher training, participants noted the abundance of opportunities they are already experiencing and their optimism for future uses of AI in the classroom. Therefore, these technologies are indeed empowering learners to acquire and increase knowledge.



Figure 2: Opportunities of AI Chatbots in Teacher Training

Overall, results suggest that teacher educators recognize learning potential in using AI generative tools. Our participants enumerated different potential positive implications of AI use which are aligned with previous studies. For example, AI can be a valuable tool in data analysis. Similar ideas have been reported in studies addressing ChatGPT, where scholars and students have observed the use of ChatGPT and identified ways in which AI technologies can facilitate individualized learning experiences to student's individual needs, enhance writing abilities, and highlight the significance of digital literacy (Firat, 2023; Nazari et al., 2021; Rasul et al., 2023). It is important to emphasize, however, that how the learning materializes (ways in which the interaction with AI affords learning) is still an open discussion. All research done so far have addressed the phenomenon through self-report of perceived learning or user experiences. A critical analysis of learning processes is still to be done.

In this study, the opinions of preservice teachers are in line with these findings as they expressed that AI tools can support research by classifying data from specific features and also able to predict solutions from databases. Nazari and colleagues (2021) examined how various AI-powered writing tools have been created to support users' self-directed learning and assist with English writing, especially in higher education. The study looked into the efficacy of an AI-powered writing tool for postgraduate students prior to the launch of ChatGPT. This is aligned with our results, which expressed the same opportunities regarding AI-powered chatbots like ChatGPT, Microsoft Bing (now Copilot), and AI chat. In addition, our participants mentioned the potential of AI chatbots in data optimization of education and research. Also, from the constructivist perspective, tailoring learning experiences to each learner's needs and learning environments is emphasized. According to constructivism, knowledge is created via interactions with peers and the environment; as a result, by seeing trends in student performance, engagement, and feedback, data-driven insights can help to improve this process. Teachers can design tailored learning pathways that promote critical thinking and active engagement by examining a variety of data sources. Additionally, by refining data collection techniques, researchers can investigate the dynamics of collaborative learning and build settings where students can co-create knowledge. In addition to improving educational outcomes, this alignment of data practices with constructivist principles also improves the state of research, opening the door to more significant and impactful learning opportunities.

Furthermore, preservice teachers mentioned that AI chatbots can reduce workload by simplifying texts and providing solutions faster. Also, AI is an evolving and intriguing process (Chennupathi,2024). Therefore, the evolution of AI requires the utmost competency for teachers. Also, productivity and efficiency are being understood as a good trade in learning processes. In a study, Trust and colleagues (2023) suggested that preservice teachers need to interact with AI technologies in their teaching. And the data reflects that preservice teachers are using AI chatbots for brainstorming ideas, planning lessons, preparing course material, translating texts, and sometimes giving feedback to students which is similar to the findings of Trust and colleagues (2023). Moreover, to keep pace with the updated AI tools, participants expressed the ideas of personalized AI for teaching and anticipated AI to be integrated into all software. Therefore, the insights of the participants to use AI tools in their teaching such as assisting to focus on students' urgent needs, simulating challenging situations in a classroom, and immediate translation of speech during online meetings advances the desired role of integrating AI chatbots in teacher training.

#### Conclusion

This research aimed to explore the opportunities and challenges of AI-powered chatbots in teacher training. The goal of the study was achieved by identifying the most notable opportunities and challenges through thematic analysis. AI chatbots like ChatGPT, Bing (now Copilot), and AI chat have the ability to support research by data optimization and analysis, enhance productivity, upgrading teaching material and learning experiences by helping in brainstorming ideas, providing so many learning resources, and summarize articles. On the other hand, the challenges of academic dishonesty, unreliable sources, and inadequate assessment design might hinder the growth of critical cognitive skills and encourage superficial learning. Consequently, teachers, students and administrators need to be clear about guidelines and their role in ensuring the ethical, dependable, and efficient use of AI chatbots for teaching-learning. This study concludes by suggesting that teachers need to prioritize teaching students how to use generative AI technologies responsibly and ethically. New assessment strategies also need to be employed to ensure that students can answer critically and participate in collaborative learning. Integrating AI literacy in teacher training education can improve the competency and preparedness of future teachers for evolving educational technology. In conclusion, by providing students' argumentative cognitive skills top priority, it is necessary to achieve a balance between reducing academic misconduct and encouraging academic innovation.

Regardless of this study's insightful findings, it is important to acknowledge its limitations. The sample size was limited to 12 preservice teachers and the findings were only about teacher training education. Participants' diversity from other faculties like the health and engineering sector can expand the understanding of the implications of AI chatbots. Therefore, the findings cannot be generalized as a whole opportunity and challenges of AI chatbots in education. The study recommends a critical examination of AI chatbots more organically into the entire curriculum of teacher education to best prepare future teachers for integration of AI tools into their curricula and practices, given its rapid development and adoption to impact nearly every aspect of society and education. Further longitudinal and experimental research are recommended to better understand the long-term implications of AI integration and its impact on teachers, students, and stakeholders in both teacher education and overall higher education. In addition, future research may examine how authenticating systems are developed to acknowledge and validate skills and knowledge obtained by AI-supported learning.

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#### Educational Leadership and Management

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#### Abstract

The role of educational leadership has become very relevant and significant due to the rapid development of information and communication technologies. The main prerequisite for the quality of education is a highly qualified personnel policy. Educational leadership implies trained and committed professionals who are responsible for managing results. While the need for effective leaders is critical, it is important to distinguish which leadership behaviors are important to achieve desired outcomes. The article examines the methodological functions of educational leadership and management and the arguments of their relative effectiveness in the context of the quality of education. The competitiveness of educational leadership depends on the development of a highly skilled workforce. Within the framework of the above, we classify the main leadership styles and principles applied in University management because educational leadership tradition offers great opportunity to further refine educational leadership and management policies and practices by obtaining and applying the basic principles and styles of educational leadership and management. Reference was also made to the analyzes and predictions of leading researchers in the field, as a result of which proposals were presented regarding the prospects for the development of educational leadership.

Keywords: Educational Leadership, The Conduct Code of Leadership, Management and Leadership, Education, Improvements, Leadership Styles

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#### 1. Introduction

Many scientists claim that leaders are not born, but made. Absorbingly, it is also recognized that in order to be a good leader, one must have the experience, knowledge, commitment, patience, and most importantly the skill to negotiate and work with others to accomplish organizational goals. Good leaders are thus made, not born. Good leadership is developed through a never ending process of self-study, education, training, and the accumulation of relevant experience. Leadership is arguably one of the most observed, yet least understood phenomena on earth (Burns, in Abbasialiya, 2010). Over time, researchers have proposed many different styles of leadership as there is no particular style of leadership that can be considered universal. Despite the many diverse styles of leadership, a good or effective leader inspires, motivates, and directs activities to help achieve group or organizational goals. Conversely, an ineffective leader does not contribute to organizational progress and can, in fact, detract from organizational goal accomplishment. Naylor (1999) argued, that effective leadership is a product of the heart and an effective leader must be visionary, creative, passionate, flexible, innovative, courageous, inspiring, imaginative, experimental, and initiates change. (see Figure 1).

- **Leadership** involves inspiring and motivating educators, students, and staff. Educational leaders create a positive and encouraging environment that promotes innovation and creativity.
- **Management** involves supervising and directing activities to ensure that tasks are completed efficiently. Managers provide the necessary oversight to maintain standards and achieve desired outcomes.



Figure 1: Qualities of the Leader and the Manager Source: Naylor (1999, p. 524)



Figure 1 (cont.): Qualities of the Leader and the Manager Source: Naylor (1999, p. 524)

# What is Educational Leadership?



Figure 2: Description of Educational Leadership

The concepts of "*manager*" and "leader" are often considered synonymous, and leadership is presented as one of the roles of a leader. However, there are some differences between management and leadership. Leadership means the ability to lead people. "The greatness of a leader lies not in his own strength, but in his ability to empower those around him. A leader inspires people and excites employees by conveying to them his vision of the future and helping them adapt to the new and move through the stage of change" (Bennis, W., 2009). In comparison to leadership, management means to direct the activities of subordinates, to be

responsible for making management decisions, and to be the official representative of the organization.

A leader has followers, while a manager has subordinates. A manager is part of a formal organization, he is appointed "from above," while a leader belongs to an informal structure, he is spontaneously nominated "from below" based on faith in his ability to show the way, help, and be a team representative. A manager can influence the behavior of subordinates by using formal organizational tools such as organizational structure, regulations, instructions, fines, bonuses, etc, whereas a leader does not have such powers at his disposal; he can only rely on his personal qualities, set an example, inspire people, cheer them on, and charge them with charisma. There are manipulative leaders who can play on people's weaknesses. Leadership, unlike management, is unstable, because at any moment the mood of the followers can change, and another leader will come to the fore.



Figure 3: Importance of Educational Leadership

#### 2. Educational Leadership and Management Processes

Leadership, as a creative enterprise, looks at the horizon and not just at the bottom-line. (Bennis, W. in Anyamele, 2004) A leader makes good decisions which imply a goal, a direction, an objective, a vision, a dream and a path. According to Bennis, a leader does the following (Bennis, W., 2009):

- *Creates a Compelling Vision:* Leadership has to get people in the organization to buy into a shared vision and then translate that vision into reality. Leaders motivate people by helping them to identify with the task and the goal, rather than by rewarding or punishing them. Leaders inspire and empower people; they pull rather than push.
- *Creates a Climate of Trust:* Leaders must know how to generate and sustain trust. In order to do this, leaders must reward people for disagreeing, reward innovation, and tolerate failure. For a leader to create trust he or she must be competent so that others in the organization can rely on the leader's capacity to do the job. To create trust a leader must behave with integrity. Finally, to generate trust (and be an effective leader) a leader must achieve congruency between what he or she does and says and what his or her vision is.
- *Creates Meaning:* A leader creates meaning by maintaining an environment where people are reminded of what is important. A leader helps to define the mission of the institution and models the behavior that will move the organization towards goals. Leaders are people who can eloquently use words to express the collective goals of the organization.

- *Creates Success:* Effective leaders perceive and handle 'failure' differently they embrace error and vow to learn from it.
- *Creates a Healthy and Empowering Environment:* Effective leadership empowers the workforce to generate commitment, and developed the feeling that organization members are learning, and that they are competent. Good leaders make people feel that they are at the very heart of things, not on the periphery.
- *Creates Flat, Adaptive, Decentralized Systems and Organizations:* Bureaucracy does not create leaders, bureaucracy creates managers and bureaucrats. Managing change is perhaps the ultimate leadership challenge. Strong leadership can often be seen in organizations based on a network or flattened hierarchy model a more centralized model where the key words are acknowledge, create and empower.



Figure 4: Importance of Educational Management

*Educational management* processes involve the arrangement and deployment of systems that ensure the implementation of policies, strategies, and action plans throughout a set of integrated practices in order to achieve educational goals. Process performance can only be optimized through a clear understanding of how different units of work fit into the whole. Process performance ensures that a fit for purpose management system of the education is developed, implemented and constantly improved. It looks at how management gathers information to inform educational policy and strategy and involves the application of systems standards covering quality management systems (Lewis et al., 1995). Process performance, when documented and analyzed scientifically and compared with desirable outcomes, generates facts on the basis of which the processes in question can be effectively managed and continuously improved. This factual information supports decisions at all levels that in turn improve educational process performance further (Schoderbek et al., 1988).



Figure 5: Leadership Effectiveness

**Educational leadership** is very critical to educational conclusiveness. To sustain it, leaders must develop sustainability on how they approach, commit to and protect teaching and learning in educational institutions; how they sustain themselves and followers around them to promote and support teaching and learning; how they are able and encouraged to sustain their vision and avoid burning out; and how they consider the impact of their leadership in educational management. Most leaders want to do things that matter, to inspire others to do it with them and to leave a legacy once they have gone (Hargreaves & Goodson, 2006). To a large extent, it is not leaders who mismanage their organizations; however, it is the system in which they lead (Mulford, 2003). Questionably, sustainable leadership certainly needs to become a commitment of all educational leaders.

# 3. Leadership Styles

Leadership is a pivotal factor in the success and growth of any organization. Leadership styles are the approaches used to motivate followers. The way leaders guide and influence their teams can significantly impact productivity, engagement, staff turnover, and overall morale. To effectively navigate their roles and build successful teams and organizations, leaders can adopt various **types of leadership** styles, each with its own unique traits and characteristics.

# **3.1. Democratic Leadership**

A democratic leadership style is where a leader makes decisions based on the input received from team members. It is a collaborative and consultative leadership style where each team member has an opportunity to contribute to the direction of ongoing projects. However, the leader holds the final responsibility to make the decision.

Democratic leadership is one of the most popular and effective leadership styles because of its ability to provide lower-level employees a voice making it equally important in the organization. It is a style that resembles how decisions are made in company boardrooms. Democratic leadership can culminate in a vote to make decisions.

Democratic leadership also involves the delegation of authority to other people who determine work assignments. It utilizes the skills and experiences of team members in carrying out tasks.

The democratic leadership style encourages creativity and engagement of team members, which often leads to high job satisfaction and high productivity. However, establishing a consensus among team members can be time-consuming and costly, especially in cases where decisions need to be made swiftly.

# **3.2.** Autocratic Leadership Style

Autocratic leadership is the direct opposite of democratic leadership. In this case, the leader makes all decisions on behalf of the team without taking any input or suggestions from them. The leader holds all authority and responsibility. The benefit of autocratic leadership is that it is incredibly efficient. Decisions are made quickly, and the work to implement those decisions can begin immediately. In terms of disadvantages, most staff resent being dealt with in this way. Autocratic leadership is often best used in crises situation, when decisions must be made quickly and without dissent.

#### **3.3 Laissez-Faire Leadership**

Laissez-faire leadership is literally defined as a compliant approach to leadership. Alternately, leaders supply their team members with the necessary tools, information, and resources to carry out their work tasks. The "let them be" style of leadership requires that a leader lets team members work without supervision and free to plan, organize, make decisions, confront problems, and accomplish the assigned projects (Chaudhry & Javed, 2012).

The laissez-faire leadership approach is empowering to employees who are creative, skilled, and self-motivated. The level of faith and independence given to the team can prove to be uplifting and can lead to job gratification.

Simultaneously, it is worth mentioning that in order to keep such a type of leadership in check as chaos and confusion can quickly ensue if the team is not organized. The team can finish up doing completely different things contrary to what the leader anticipates.

According to research, laissez-faire leadership is the least abundant and least effective.

# **3.4.** Transformational Leadership

Transformational leadership is all about transforming the groups by inspiring team members to keep increasing their bar and accomplish what they never thought they were capable of. Transformational leaders expect the best out of their team and push them consistently until their work, lives, and businesses go through a transformation or significant improvement.

Transformational leadership is about acquiring change in organizations and people. The transformation is done by motivating team members to go beyond their comfort zone and obtain much more than their perceived capacities. To be efficient, transformational leaders should possess high levels of integrity, emotional intelligence, a shared vision of the future, empathy, and good communication skills.

Such style of leadership is often associated with high growth-oriented organizations that push boundaries in innovation and productivity. Practically, such leaders tend to give employees tasks that grow in difficulty and deadlines that keep getting tighter as time progresses.

However, transformational leaders risk losing track of individual learning curves as some team members may not receive appropriate coaching and guidance to get through challenging tasks. At the same time, transformational leaders can lead to high productivity and engagement through shared trust and vision between the leader and employees.

# **3.5.** Transactional Leadership

Transactional leadership is more short-term and can best be described as a "give and take" kind of transaction. Team members agree to follow their leader on job acceptance; therefore, it's a transaction involving payment for services rendered. Employees are rewarded for exactly the work they would've performed. If you meet a certain target, you receive the bonus that you've been promised. It is especially so in sales and marketing jobs.

Transactional leadership establishes roles and responsibilities for each team member and encourages the work to be completed as scheduled. There are instances where incentive programs can be employed over and above regular pay. In addition to incentives, there are penalties imposed to regulate how work should be done.

Transactional leadership is a more direct way of leadership that eliminates confusion between leader and subordinate, and tasks are clearly spelled out by the leader. However, due to its rigid environment and direct expectations, it may curb creativity and innovation. It can also lead to lower job satisfaction and high employee turnover.

#### **3.6.** Bureaucratic Leadership

Bureaucratic leadership is a "go by the book" type of leadership. Processes and regulations are followed according to policy with no room for flexibility. Rules are set on how work should be done, and bureaucratic leaders ensure that team members follow these procedures meticulously. Input from employees is considered by the leader; however, it is rejected if it does not conform to organizational policy. New ideas flow in a trickle, and a lot of red tape is present. Another characteristic is a hierarchical authority structure implying that power flows from top to bottom and is assigned to formal titles.

Bureaucratic leadership is often related with large, "century-old" organizations where success has come through the employment of traditional practices. Therefore, proposing a new strategy at these organizations is met with vicious resistance, especially if it is new and innovative. New ideas are viewed as wasteful and ineffective, or even downright risky.

Although there is less control and more freedom than an autocratic leadership style, there is still no motivation to be innovative or go the extra mile. It is, therefore, not suitable for young, ambitious organizations on a growth path.

Bureaucratic leadership is capable for jobs involving safety risks or managing valuable items such as large amounts of money or gold. It is also ideal for managing employees who perform routine work.
## **3.7.** Servant Leadership

Servant leadership concerns a leader being a servant to the team first before being a leader. A servant leader endeavors to serve the needs of their team above their own. It is also a form of leading by example. Servant leaders try to find ways to develop, excite and encourage people to achieve the best results.

Servant leadership requires leaders with high integrity and munificence. It creates a positive organizational culture and high morale among team members. It also creates an ethical environment characterized by strong values and ideals.

However, other scientists believe that servant leadership may not be suitable for competitive situations where other leaders compete with servant leaders. Servant leaders can easily fall behind more hard-driving leaders. The servant leadership style is also criticized for not being nimble enough to respond to dense deadlines and high-velocity organizations or situations.

#### 4. Conclusions

The role of the educational leadership and management will become very significant in the democratization of the student-teacher relationship, involving the creation of a positive climate. The importance of Lifelong learning becomes very crucial in the dynamics of a society, and knowledge is the main driver, whose presence promotes key skills, a high occupancy rate, and fulfilment on a personal level. Educational management, training, leadership, are actual concepts more than ever in the present in reality. The manager's role is to perpetually examine the evolution of demand in the labor market, to systematically consult and modify strategies in order to benefit students under existing and future situations. This article has discussed the effectiveness of educational leadership and management. Educational leadership tradition offers great opportunity to further refine educational leadership and management policies and practices by accepting and utilizing the basic principles and styles. Educational managers know that leadership requires a number of judgments each day that requires acuity and understanding of various leadership strategies. Thus, bridging the gap between theory and practice should be able to provide exploration of dominant leadership strategies to give University leaders a reasonable basis in theory and practical application. Effective educational leadership style in University management is relatively fast, easy and cost effective if applied appropriately. The results of the effective educational leadership style applications are suitable for a number of purposes, which include improve administrative performance, team-building, and refined individual and University innovation in teaching and learning.

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# Digital Transformation and Teacher Competencies in Higher Education: A Post-pandemic Analysis

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#### Abstract

The COVID-19 pandemic accelerated the integration of Learning and Knowledge Technologies (TAC) in higher education in Colombia, following directives from the Ministry of National Education (MEN) that mandated the virtualization of academic activities. This study examines the impact of this situation on the digital competencies of educators across five key areas. A qualitative approach was employed, utilizing virtual ethnography and hermeneutic methodology to interpret data collected through online questionnaires. The data was analyzed using Nvivo software to identify patterns and trends in teachers' media literacy. The findings indicate a general improvement in the digital competencies of educators between 2019 and 2022. The area of informational literacy showed stability with a trend towards high competence levels. In the realm of digital communication and interaction, there was a notable increase in the use of digital tools for collaboration. Content creation also saw an enhancement, particularly in the application of intellectual property rights and usage licenses. Additionally, there was a heightened awareness and application of information security measures. Problem-solving emerged as an area of growth, with educators developing skills to address unexpected challenges in digital environments. The pandemic significantly advanced educators' digital competencies, facilitating better adaptation to TAC. This progress included greater technological integration in higher education, overcoming generational and geographical barriers, and promoting content creation and digital interaction.

Keywords: Digital Transformation, Teacher Competencies, Higher Education, Media Literacy

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#### Introduction

The incorporation of Information and Communication Technologies (ICT), particularly social web tools, has brought about significant changes in teaching practice. These technologies have radically transformed how teachers access and use information, leading to a redefinition of their roles and functions. Access to a wide range of digital resources, communication platforms, and collaborative tools has facilitated research and continuous professional development, enabling teachers to stay up to date with the latest trends and advancements in their areas of expertise.

Moreover, knowledge management has been transformed as ICT has facilitated the creation, storage, and dissemination of educational content in different ways. Teachers can now collaborate with colleagues from various parts of the world, share resources and experiences, and participate in online communities of practice. This global connectivity has fostered a culture of knowledge exchange that transcends geographical and cultural barriers.

On the other hand, educational innovation has taken on a new dimension with the possibility of integrating emerging technologies into the teaching-learning process. Social web tools allow for the creation of more interactive and participatory learning environments, where students are not mere recipients of information but active participants in knowledge construction. This transformation requires teachers to acquire new competencies and skills, including digital literacy, the ability to assess and select appropriate technological resources, and the skill to design learning experiences that effectively integrate these technologies.

In this context, there is a need for an education professional who goes beyond the mere transmission of content and adopts a pedagogy centred on the formulation of questions. This approach, which places special emphasis on students' ability to create and innovate, seeks to foster critical and reflective thinking. Teachers must be able to guide students in exploring open-ended questions and complex problems, promoting a culture of curiosity and inquiry both inside and outside the classroom (Reig, 2012). This new pedagogy implies a paradigm shift, where the teacher's role evolves from being a source of knowledge to a facilitator of learning, supporting students in their process of discovery and the creation of new knowledge.

Authors such as González, Rincón, and Contreras (2013) describe the profound transformation faced by teachers in blended learning contexts (b-learning), to the point where they become "prosumer teachers," a term denoting the ability to produce and consume knowledge unilaterally. This transformation reflects a change in the traditional role of the teacher, who now must adapt to an environment where technology and digital media play a central role in the educational process. The figure of the "prosumer teacher" is key in this new scenario, as educators are not only expected to generate educational content but also to actively participate in its consumption and critical evaluation, promoting more dynamic and interactive learning.

In this regard, there is a highlighted need to develop advanced digital competencies, which include not only technical skills but also a critical understanding of media and the ability to integrate them effectively into teaching. Media literacy, or "new literacy," thus becomes an essential component of teacher training, especially in higher education. This concept encompasses teachers' ability to use, analyse, and critically evaluate digital tools, and to teach students to do the same (Buckingham, 2003).

Based on this premise, this study proposes to identify and hierarchically classify the digital competencies of teachers related to media literacy in higher education in Colombia, in the context of the COVID-19 pandemic. The global health crisis has accelerated the adoption of digital technologies in education, highlighting the importance of teachers being prepared to face the challenges this entails. The pandemic has acted as a catalyst for change, forcing educational institutions to reassess their pedagogical approaches and teachers to quickly adapt to new teaching and learning methods (Hodges et al., 2020).

## Higher Education and Digital Transformation in Colombia

Since 13 March 2020, the Colombian Ministry of National Education (MEN) mandated that all educational institutions carry out their academic activities virtually. This included Directive 04/2020, which allowed higher education programmes with qualified registration in face-to-face mode to operate virtually. In May 2020, it was established that education in Colombia would continue virtually until August 2022. These measures required Higher Education Institutions (HEIs) to quickly transform their face-to-face educational offerings into virtual environments, ensuring the continuity of academic activities in a new normal.

The adaptation process included not only the implementation of technologies for virtual teaching but also the restructuring of academic administration and resource management, which was fundamental in addressing the financial and operational challenges posed by the pandemic. Many institutions managed to maintain or even increase their enrolments, partly thanks to the flexibility of digital formats and the ability to offer programmes to a broader audience, including access to additional funding for students. This allowed for financial sustainability and avoided significant tuition increases, thus providing stability during uncertain times (McKinsey & Company, 2020).

In the global context, digital transformation in higher education was not only a response to the public health crisis but also an opportunity to renew and improve academic practices, driving innovation and collaboration through digital platforms. Thus, HEIs have begun integrating these new dynamics into their educational mission, linking financial and academic objectives to strengthen their offerings and ensure a return on the institutional mission. This comprehensive approach has allowed many institutions not only to survive the crisis but also to lay the foundations for sustainable growth and development in the long term.

# Media Literacy

Media literacy, or new literacy, refers to the ability to understand, critically evaluate, and use media and the information presented through them. It involves developing skills to analyse and comprehend media messages in various formats, such as television, radio, the internet, social networks, newspapers, and magazines, among others, as well as competencies for using digital tools. This form of literacy goes beyond simple reading and writing, encompassing proficiency in using and interpreting media in everyday life.

Some key aspects of media literacy include the ability to identify and understand how media are produced, who controls them, and how they influence society and culture. Furthermore, the skill to assess the truthfulness, accuracy, and credibility of the information presented is crucial, recognising the ideological, political, or commercial biases that may influence the way news and information are presented (Kellner & Share, 2007). This critical evaluation is

essential in a world where misinformation and fake news can significantly impact public opinions and individual decisions.

Moreover, media literacy focuses not only on the passive reception of information but also advocates for the production and exchange of one's own media content in an informed and ethical manner. This includes the competence to use technological tools and digital platforms ethically and responsibly. In this context, the concept of socionomy is introduced, which refers to individuals' ability to create, share, and collaborate in media content creation, leveraging the opportunities that digital technologies offer for active participation in society (Reig, 2012b). This approach empowers individuals not only as critical consumers of media but also as responsible creators who contribute to public discourse.

Moreover, the need for a process of technological literacy extends not only to teachers but also to students and other members of the educational community. This is essential before teachers can fully adopt the stance of prosumers. According to Buckingham (2003), media literacy in the digital age includes the ability to understand and use a variety of media, which is essential for effective participation in modern society.

For centuries, literacy has focused on the ability to read and write, but today, with most information emerging through a network of media technologies, the ability to read and understand various types of media has become an essential 21st-century skill. Digital competencies, therefore, involve the ability to access, analyse, evaluate, and engage with media. This skill set is vital not only for effective communication but also for developing critical thinking, understanding how media messages influence culture and society, and identifying persuasion techniques and informational biases.

#### Concept of Digital Competence for Teachers

Digital competence for teachers, according to various perspectives, goes beyond operational and technical skills. It includes the ability to manage information, communicate in social environments, and use the internet for learning. Additionally, it relates to the development of critical thinking, creativity, and innovation. Digital competence is not limited to decoding and encoding information but encompasses a set of knowledge, skills, and attitudes necessary to be functional and effective in a digital environment.

Digital competence for teachers, as part of media literacy, has been defined and conceptualised in various ways by different authors and organisations. The 2006 European recommendation defines digital competence as "the critical and secure use of information society technologies for work, leisure, and communication. This competence is based on basic ICT skills, such as using computers to retrieve, evaluate, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the internet" (Recommendation 2006/962/EC of the European Parliament and of the Council of 18 December 2006). This definition underlines the importance of technical and operational skills as an essential part of digital competence.

Table 1 presents the foundational areas for the development of teachers' digital competences and the specific competences (at the level of indicators) in each development area. This study uses these sources to measure and classify the levels of teachers' training.

14010 1.	Theas for the Development of Teacher's Digital Competences
Area	Competencies
Information and	<ul> <li>Navigates the internet to locate information and digital educational</li> </ul>
Media Literacy	resources.
	• Presents needs, selects information, and the appropriate digital resource
	to meet them.
	• Knows the usage licences that allow the reuse or dissemination of
	The function of a departicular and any the internet
	• Evaluates the quality of educational resources found on the internet.
	• Knows now to save and tag files, content, and information.
	• Knows how to retrieve and manage saved or lost information and
<u> </u>	
Communication	• Interacts seamlessly (synchronously and asynchronously) through
and	various applications.
Collaboration	• Selects the appropriate digital interaction medium according to the recipients of the communication
	Participates in social networks and online communities
	• Utilises intermediate aspects of online services (e.g., electronic offices
	• Other services (e.g., electronic offices,
	Constant a desetional and deste in cellaboration with other teachers and
	• Creates educational products in conadoration with other teachers and students online
	Develops a protocol for online communication
	• Develops a protocol for online communication.
	• Knows now to create their digital identity and track their digital
	• Manages data generated in various accounts and digital channels.
Digital Content	• Produces digital content in different formats using online applications.
Creation	• Promotes content production among students.
	• Knows and uses repositories and/or libraries of online resources and
	materials.
	• Modifies and adapts resources from other users to meet students' needs.
	• Knows the basic differences between open and proprietary licences and
	Develops activities related to respecting convright
	• Makes modifications to advactional programming applications
	• Makes mounications to educational programming applications
Safaty	• Undetes knowledge about digital threats to devises
Salety	• Manages technology protection measures appropriately
	• Wanages technology protection measures appropriately.
	• Understands how data is collected and used
	Develops activities related to the digital protection of personal data
	• Understands the health risks associated with technology use (from
	• Onderstands the health fisks associated with technology use (from
	• Makes decisions about the purchase and disposal of technologies
Problem Solving	Solves technical problems with devices and digital environments
r robiem solving	common in academic work
	• A seesses the digital services offered to resolve technological problems
	• Uses digital technologies to create products and participate in projects
	dynamically adapting the media
	• Explores emerging digital technologies to stay undeted and address sons
	- Explores emerging uignar teenhologies to stay updated and address gaps
	וו עוצוגם לטוווףכובוולב.

Table 1: Areas	for the Develo	opment of Teachers'	Digital Competences
10010 11110000	101 0110 20 0 1 010		

## **Research Methodology**

Considering the complexity of analyzing the educational phenomenon and the impact of social media and research in higher education, this proposal will adopt a qualitative approach (Sautu et al., 2005; Valles, 2001), supported by virtual ethnography (Hine, 2004) to establish social trends and data from documentary interpretation and category analysis that allow for an in-depth understanding of the study object (prosumer teachers). This methodology considers various sources or primary documents in line with the object of study. In terms of processing emergent data from general and substantive theory, constant comparison will be employed, which confers greater reliability and relevance to the results, enabling a solid foundation for data analysis carried out with the software Nvivo.

The qualitative approach is suitable for this research due to the inherent complexity of the educational phenomenon and the implications of social media and research in higher education. This approach allows for an in-depth and detailed exploration of the phenomena studied, in this case, the transformation of teachers into "prosumer teachers" and their relationship with media literacy. The choice of virtual ethnography as a specific method is pertinent given the digital context in which current educational processes develop, facilitating the observation and analysis of teachers' interactions and practices in digital environments.

## **Data Collection Techniques**

A questionnaire was developed on a virtual platform as a data collection technique aligned with the principles of the qualitative approach, providing an effective means to explore and understand the complex realities of digital competencies and media literacy in the educational field. This technique allowed for capturing the depth and diversity of teaching experiences, offering a solid foundation for qualitative analysis and interpretation.

The questionnaire was designed without specific hypotheses, which is characteristic of the qualitative approach that seeks to understand and explore phenomena in depth. This technique allows for gathering information on how teachers perceive and experience their digital competencies, providing a rich and detailed view of their practices and experiences.

The use of a virtual platform to distribute the questionnaire facilitates access to a wide population of teachers, which is essential in a context where geographical distance and time availability may be limiting factors. Furthermore, collecting data in a standardized format simplifies comparative analysis, allowing for the contrast and correlation of the data obtained with other studies or different participant groups.

Similarly, the online questionnaire enabled the rapid collection of data, which was useful in requiring a swift response to contextual changes, such as those caused by the COVID-19 pandemic in teaching practices. The immediacy in collecting and processing information facilitated analysis and decision-making based on current and relevant data.

#### **Results and Discussion**

A total of 69 teacher-researchers from various higher education institutions in Colombia were characterized, who are registered in the National Education Ministry's Misión de Sabios database. The levels of education were classified as follows: Postdoctoral 8, Doctorate 22, Specialization 3, Master's 33, Undergraduate 3.

The distribution of teaching modalities among the participants is as follows: 69% of teachers work in face-to-face settings, 26.1% work in virtual or distance education without in-person components, and 18.8% engage in blended or mixed modalities, combining in-person instruction with the use of ICT in the classroom. This distribution reflects the diversity of educational approaches adopted by institutions, addressing the specific needs and circumstances of each context.

The skills for developing digital competencies among teachers have emerged from various sources of knowledge. As shown in Figure 1b, autonomous learning through trial and error and deduction, along with training courses offered by educational institutions, are the main ways teachers have strengthened their digital competencies. This finding highlights the importance of self-directed learning and continuous training to adapt to technological and pedagogical changes. The ability of teachers to learn autonomously and apply new technologies in their educational practice is essential to stay current and provide relevant and effective learning experiences.

For each of the estimated areas, specific teaching competencies have been identified and generated. In the applied questionnaire, the digital skills of teachers were compared before the COVID-19 pandemic (2019) with those acquired afterward (2022). According to Table 1, areas of competencies were defined for classification and comparison, allowing a detailed view of strengths and areas for improvement. Additionally, Table 2 presents the measurement levels for each competency, providing a quantitative framework for assessing progress and skill acquisition.

The results indicate a significant increase in teachers' digital competencies, particularly in areas related to the use of technological tools for teaching and managing virtual learning environments. This suggests that the pandemic has acted as a catalyst for the adoption of educational technologies, prompting rapid adaptation and the development of new skills. This adaptation process has been crucial not only for ensuring educational continuity during the health crisis but also for preparing teachers to face the challenges of 21st-century education.

10010	2. Classification Devels of Teaching Competencies
High	Develops the competency autonomously, can even share and teach related knowledge, can generate complex elements and analyze them deeply and with expertise.
Medium	Feels comfortable with the statement, demonstrates skill in the mentioned field, can account for their knowledge in this area.
Low	Considers that the proposed statement does not describe their knowledge, does not understand some terms or actions presented, knows the terms but does not apply them in their work.

Table 2: Classification Levels of Teaching Competencies

# Area 1 – Information and Informational Literacy

The area of Information and Informational Literacy focuses on teachers' ability to identify, locate, obtain, store, organize, and analyze digital information, data, and content, evaluating its usefulness and relevance for educational tasks. This domain is essential in an increasingly

digital academic environment, where effectively managing information is crucial for success in teaching and pedagogical innovation.

When comparing the results obtained before and after the pandemic, two main trends can be observed in this area. First, regarding the recovery and management of information, data storage and labeling, evaluation of educational resources, and use of licenses, a significant improvement has been noted among teachers who initially had a low level of competency. These teachers have progressed to a medium level, indicating a notable acquisition of skills and advancement in handling tools and techniques for effective information management. This progress is crucial for ensuring that educational resources are relevant and useful for the teaching process.

Second, in terms of navigating and selecting information to address specific educational needs, considerable improvement has been observed. Teachers have shown progress by moving from a low to a medium level in their ability to search for and utilize appropriate resources. This change reflects increased skill in conducting effective information searches and using the resources found efficiently. The elimination of cases where teachers did not manage these competencies adequately highlights progress in informational literacy, contributing to higher-quality teaching and better resolution of educational problems.

These results, represented in Figure 1, underscore the importance of continuous training and institutional support in developing digital competencies. The transition from a low to a medium level in these skills not only indicates individual progress for teachers but also an overall improvement in the educational system's ability to adapt to the demands of a digital environment. Training and professional development are crucial for equipping teachers with the necessary tools to effectively manage information and maximize the potential of digital resources in the classroom.



Figure 1: Comparison of Competencies in Area 1: 2019–2022

#### Area 2 – Communication and Interaction

In the area of Communication and Interaction, teachers have shown significant progress in their ability to use digital environments for communication, share resources through online tools, connect and collaborate with others, interact in communities and networks, and develop intercultural awareness. This area is crucial in the digital age, where the ability to communicate and collaborate effectively in virtual environments has become essential.

Among the most notable achievements at a high level is active participation in social networks and online communities. Teachers have demonstrated effective use of these platforms to foster academic collaboration, both in interactions with colleagues and in academic support for students. The integration of these skills into virtual platforms and the collaboration between teachers and students reflect an advanced use of available digital tools. This type of participation not only improves communication but also enriches the teaching and learning process through the exchange of ideas and resources.

Additionally, there has been notable progress in competencies that were initially at a low level but have advanced to a medium level. These include the ability to develop online communication protocols and manage one's virtual identity. Developing communication protocols helps establish clear and effective norms for interacting in digital environments, while proper management of virtual identity allows teachers to present a professional and coherent image in their online interactions. These advancements indicate an improvement in how teachers manage their communication and presence in the digital environment.

The achievements in the area of Communication and Interaction demonstrate significant advancement in teachers' digital skills. Effective participation in social networks and online communities, along with improvements in developing communication protocols and managing virtual identity, indicate robust development in the competence to communicate and collaborate in digital environments. These advancements contribute to a more dynamic and collaborative learning environment, adapted to the demands of modern education.



Figure 3: Comparison of Competencies Area 2: 2019–2022

#### Area 3 – Content Creation

In the Content Creation area, crucial skills are addressed, including the creation and editing of digital content, the integration and reworking of previous knowledge and content, the production of artistic and multimedia materials, and programming. Additionally, the proper application of intellectual property rights and usage licenses is essential.

A notable aspect in this area is the mastery of open licenses and their impact on digital content. Educators with advanced competencies in this area have demonstrated a deep understanding of how licenses affect digital content. These experts in open license management maintain a high level in this competency, with minimal growth compared to other competencies. This indicates that raising the level in this specific skill requires specialized and ongoing knowledge due to its complexity and the need for a detailed understanding of the legal and practical implications of usage licenses.

On the other hand, there has been general growth in competencies related to digital content creation, with most skills at medium and high levels. Competencies showing significant progress include the use of applications for content development and the utilization of online repositories. The ability to use these tools and resources is crucial for the effective creation and editing of digital materials. The trend indicates that, while there is an increase in the mastery of these skills, some cases still exhibit low levels, particularly in more advanced areas of multimedia content creation and computer programming.

In conclusion, the content creation area has shown notable progress in most competencies, with significant advancement in the use of applications and digital resources. However, mastery of open licenses remains a challenge that requires deeper specialization. These results underscore the need for additional training in specific aspects of digital content creation to achieve a higher and more efficient level of competence in all aspects of digital content management.



Figure 3: Comparison of Competencies Area 3: 2019–2022

## Area 4 – Security

In the Security area, which covers the protection of information and personal data, digital identity security, digital content protection, and the responsible and safe use of technologies, significant progress in competency development has been observed.

All components of this area have shown a consistent improvement in levels. Specifically, the low level of competency has steadily decreased across all evaluated aspects, while the medium level has seen a notable increase. This suggests a greater awareness and application of security measures by educators, reflecting an evolution in managing digital security. The attention that was previously limited to digital security has increased, becoming a crucial aspect in preparing and executing teaching activities.

Overall, these changes demonstrate that digital security has gained greater relevance in the educational context. The decrease in the low level and the increase in the medium level indicate that educators are paying more attention to the protection of their data, their digital identity, and the content they manage. Figure 5 illustrates these advancements, highlighting how the focus on security has become an integral part of teaching practice, adapting to the demands and challenges of an increasingly complex digital environment.

In summary, the security area has shown positive development in the competency of handling information and digital identity securely. Although advanced levels remain an area for improvement, progress at the intermediate level is a clear indicator of the growing importance educators place on digital security in their professional practice.



Figure 4: Comparison of Competencies Area 4: 2019–2022

# Area 5 – Problem Solving

In the Problem Solving area, the focus is on evaluating educators' ability to identify the need for digital resources, make informed decisions about the most appropriate digital tools, solve conceptual problems using digital means, use technology creatively, address technical issues, and update their own competencies as well as those of others.

The results show significant development in the ability to explore digital technologies and use them to create dynamic projects. This competency has received notable emphasis, reflecting considerable progress in the creative application of digital tools to develop innovative projects in the educational field. The ability to explore and apply new technologies is crucial for addressing emerging challenges and maximizing the resources available in the digital environment.

The increase in the medium level reflects an ongoing effort by educators to improve their problem-solving skills using digital technologies. Additional training and practice in these competencies have enabled educators to more effectively face technological challenges and resolve issues more efficiently.

Figure 6 illustrates these advancements, highlighting how, despite the fact that higher levels of competency have not changed dramatically, training and development in the Problem Solving area have led to a general improvement in educators' ability to use digital technologies effectively and creatively. This progress underscores the importance of continuing training and support in the use of digital tools for problem-solving and staying updated in the field of educational technology.



Figure 5: Comparison of Competencies Area 5: 2019–2022

# Conclusion

In the context of the COVID-19 pandemic, the Ministry of National Education (MEN), through directive 04/2020, allowed academic programs in higher education with qualified registration in face-to-face modality to conduct their activities in virtual format. This situation significantly accelerated the integration of Learning and Knowledge Technologies (TAC) into academic programs.

Since 2022, notable advances have been observed in the use and appropriation of TAC. Teachers and students have been key elements in this transformation process. Motivated and driven by the need to adapt to the new reality imposed by the pandemic, educators have overcome barriers related to skills, generational differences, and technological knowledge. Meanwhile, students, with their expertise, self-development capacity, and enthusiasm for new

teaching modalities (virtual and b-learning), have significantly contributed to the success of this change, creating a new digital learning ecosystem.

The results obtained in this study confirm that self-training and adaptation to the context have been essential for the evolution in the use of TAC. Five areas of digital teaching competencies were analyzed, which, interrelated and harmonized during the pandemic, have revealed new opportunities for training both students and educators and institutions. This process has demonstrated the importance of flexibility and resilience in higher education, highlighting the potential of TAC to transform educational practices and improve the quality of learning in virtual contexts.

In summary, during the pandemic period (2019-2022), there was a noticeable increase in the level of performance in digital competencies. Educators expanded their knowledge, overcame generational gaps in technology use, and took the opportunity to integrate TAC into their educational practices with favorable results. This context allowed for the implementation of rapid and effective training paths, such as the mentoring program at some universities, and encouraged students to overcome the fear of the absence of face-to-face classes, fostering self-awareness and virtual collaboration. Additionally, spatial and distance barriers were overcome, and educators actively engaged in the creation and development of content and knowledge.

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# Public Education Policies: Ergonomic Aspects, Teaching Methodology and the Teaching and Learning Process

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#### Abstract

This paper analyzes the influence of ergonomic aspects of classrooms on the learning process. The objective is to analyze the comfort and accessibility of classrooms, the teaching methodology and the teaching and learning process. In the school environment, there are spaces configured according to the Brazilian educational policy to meet the basic needs of educational institutions. The basic elements of analysis include furniture, equipment, environmental comfort (ergonomics), accessibility. The research methodology was bibliographic and documentary, descriptive, exploratory and quantitative. In addition, it involved the ergonomic evaluation of classrooms, evaluation of the space with regard to structural safety/accessibility. The research was conducted with students of the technical course in occupational safety in the northeast region of Brazil. The results showed that the ergonomic evaluation of classrooms is essential to identify and correct environmental discomforts, in accordance with the Technical Standards and Regulatory Standards NR-17 and public education policies. This study concludes that educational institutions must consider the individual needs of students, ensuring that the physical space favors not only cognitive learning, but also emotional and social well-being. The analysis of classroom comfort, together with traditional and/or active teaching methods, revealed the need for adjustments to provide an efficient and inclusive learning environment. Educational institutions must invest in adequate infrastructure and teaching methodologies that favor the integral development of students, ensuring a more equitable and inclusive education.

Keywords: Educational Policies, Ergonomic Comfort, Teaching Method, Learning

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#### Introduction

Public education policies are essential to ensure quality education, covering not only pedagogical content but also ergonomic aspects, methodology, and the teaching-learning process (Kowaltowski, 2011). The influence of ergonomic aspects of classrooms on the teaching and learning process, contextualized within public education policies, aims to promote an inclusive democracy both in Brazil and worldwide. Educational institutions have adapted their buildings to meet the needs of social and cultural development, accessibility, and inclusion, reflecting a global movement toward equitable education (UNESCO, 2020). The objective is to analyze the comfort and accessibility of classrooms, the teaching methodology, and the teaching and learning process. In the school environment, there are spaces configured according to Brazil's educational policy to meet the basic needs of educational institutions (FNDE, 2023; Santos Pinheiro et al., 2017). School architectural models include different environments, such as administration, laboratories, libraries, common areas, and multi-sports environments (Sardinha et al., 2017; Amorim & Campos, 2022a). Basic elements of analysis include furniture, equipment, environmental comfort (ergonomics), accessibility, and fire prevention and fighting systems (Silva, 2023; Regulatory Standard 17, [NR-17], 2022). The methodology used involved an ergonomic assessment of the classroom and bibliographic and documentary research of a descriptive, exploratory, and quantitative nature. The research was carried out using a questionnaire in a class of 40 students of the technical course in occupational safety in the state of Pernambuco, Brazil (Gil, 2019; Marcone & Lakatos, 2017; Severino, 2017). The ergonomic assessment of the classroom is essential to identify and correct environmental discomforts, in line with the Brazilian Technical Standards NBR 9050/2020, which defines accessibility standards for buildings and furniture, and the Regulatory Standards NR-17 (Oliveira & Cavalcante, 2021; Iida & Buarque, 2021).

Democratic educational policies are essential to promote an inclusive and equitable educational system, both in Brazil and in other global contexts. They go beyond meeting basic needs, seeking to ensure equal educational opportunities for all, regardless of individuals' socioeconomic conditions (Crochick et al., 2020; Frigotto et al., 2014). In this sense, transformations in school buildings play a central role, contributing to social and cultural development and to the implementation of accessibility and inclusion, indispensable elements in a truly democratic and quality education (Sardinha et al., 2017). In this context, given the many challenges faced by the Brazilian education system, it is essential that public policies be integrated and coordinated, involving all levels of government and different areas of activity. According to Gadotti (2000), education needs to be viewed as a collective project, requiring coordination between infrastructure, teacher training and inclusive practices to guarantee the right to quality education. In this context, continuous investments are essential, including improvements to the physical conditions of schools, teacher training and the promotion of pedagogical methodologies that meet the sociocultural diversity of students (Saviani, 2008).

Furthermore, strengthening vocational education is a strategic path towards a more equitable society. According to Aranha (2020), valuing this type of education is crucial to expanding opportunities for access to the job market and fostering social development. These investments, aligned with educational inclusion policies provided for in the Law of Guidelines and Bases for National Education (LDB, Law No. 9,394/1996, 1996), ensure that all students, regardless of their socioeconomic background, have equal opportunities for success and comprehensive development.

# Contextualization

The development of public policies in education is a central tool for ensuring quality education that encompasses not only pedagogical content, but also fundamental aspects such as ergonomics, teaching methodologies, and the teaching-learning process (Villarouco et al., 2015). According to Saviani (1992; 2008), these policies play a structuring role in promoting the democratization of access to education and ensuring conditions for students to remain in school and succeed. Legislation and specific programs support these initiatives. The LDB (Law No. 9,394/1996, 1996) establishes the fundamental principles and objectives for the organization of education in Brazil, highlighting the importance of harmoniously articulating teaching, research, and extension. Furthermore, programs such as the National Fund for the Development of Education (FNDE) work to finance projects aimed at school infrastructure and improving accessibility, as discussed by Oliveira and Cavalcante (2021) in their analysis of passive fire protection in school projects.

These initiatives reflect a commitment to building educational environments that ensure the well-being of students and teachers. Studies such as those by Ruas (1999) and Silva (2023) indicate that ergonomic comfort is a determining factor for the success of the teaching-learning process, while Moro (2005) highlights that the adequacy of school furniture can significantly influence students' health and performance. Such evidence reinforces the need to integrate policies that not only expand access to education, but also qualify teaching spaces and methods. Public policies and ergonomics in the educational context reflect the quality of the school environment and the impact on teaching and learning. Public policies in education that address accessibility, teaching methods, and comfort in the classroom are essential to ensure an inclusive, effective, and conducive environment for learning (Souza & Teixeira, 2019; Kowaltowski et al., 2005; Araújo et al., 2018).

# **Accessibility Policies**

Educational accessibility policies aim to ensure that students with disabilities or specific needs have the same learning and participation opportunities as their peers (Dela Cruz et al., 2023; Toyinbo, 2023; Smith, 2012). Some measures include:

- School Inclusion: Laws such as the Brazilian Law for the Inclusion of Persons with Disabilities (Law No. 13,146/2015) ensure the right to inclusive education and access to the necessary resources so that students with disabilities can study in regular schools;
- Adaptation of Spaces and Materials: The policies provide for the physical adaptation of institutions, with ramps, elevators, Braille signage and appropriate furniture. They also include the provision of accessible teaching materials, such as Braille books, audiobooks and assistive technologies;
- Teacher Training for Inclusion: Many teacher training programs aim to train teachers to work with students with different needs, providing adaptive teaching that is sensitive to the specificities of each student;
- Policies on Teaching Methods: Policies involving teaching methodologies encourage the use of pedagogical practices that promote more active, relevant and inclusive learning.

# **Comfort and Ergonomics Policies in the Classroom**

The physical environment has a direct impact on the concentration and well-being of students and teachers. Comfort and ergonomics policies seek to ensure that classrooms are suitable for learning (Oliveira & Cavalcante, 2021; Pinto et al., 2013; Ruas, 1999; Sanoff, 2001). Measures including infrastructure and ergonomics on school furniture, such as adjustable ergonomic tables and chairs, are essential for the physical comfort of students. The LDB requires schools to have an adequate, safe structure with school environments with leisure and communal areas, libraries so that students have spaces for rest and socialization.

# **Key Examples of Policies and Programs**

Accessibility Program in Basic Education: Government program that provides for the adaptation of schools to make them accessible and the training of teachers to work with students with disabilities. The National Policy for Special Education in the Perspective of Inclusive Education promotes the inclusion of students with disabilities in regular schools and encourages the use of adaptive and inclusive teaching methods. The FNDE – National Fund for the Development of Education is responsible for resources for furniture, teaching materials and technology for schools, with the aim of improving the physical and ergonomic conditions of educational environments. The LDB (Law No. 9,394/1996, 1996) provides guidance on the organization of school spaces and the promotion of an adequate and comfortable learning environment. These public policies are essential for the development of accessible and quality education, promoting an inclusive environment, active methodologies and a physical space that favors the learning and well-being of all students.

# **Teaching Methodologies**

The teaching methodologies adopted and developed in educational institutions involve diversified and adaptable approaches to the different needs of students, aiming to make learning more effective and meaningful. Studies by the authors (Capelletti, 2022; Reisslein et al., 2005; Palú et al., 2020; Luckesi, 2011). Among the most relevant methodologies by the authors are:

- Traditional Teaching: Based on lectures and centered on the teacher, it is a methodology that structures the content in a linear and hierarchical way. It is widely used, but has been complemented by more interactive methods;
- Active Methodologies: Such as problem-based learning (PBL) and project-based learning (PBL), which encourage students' autonomy and active participation in the construction of knowledge, promoting the development of critical and collaborative skills;
- Hybrid Learning: Integrates face-to-face teaching with digital and online resources, allowing learning to be personalized and optimizing classroom time for collaborative and practical activities; and
- Collaborative and Cooperative Learning: Focuses on group work and cooperation between students, developing social skills and collective learning.

Planned and contextualized educational methodologies are essential to ensure dynamic, inclusive teaching adapted to contemporary demands. Ongoing teacher training and the provision of adequate resources are essential steps for these practices to be consolidated in educational institutions. The development of active methodologies and the use of educational technologies are highlighted in national studies and policies, such as the National Common

Curricular Base (BNCC) and the objectives of the National Education Plan (PNE), which aim to prepare students for the challenges of the 21st century (Saviani, 2008; Valente, 2014).

The structuring of teaching environments that take into account pedagogical, technological and ergonomic aspects is essential. This includes the use of digital platforms, interactive tools and audiovisual resources that promote autonomous and collaborative learning. The FNDE (2023), through programs such as the National Book and Teaching Material Program (PNLD), has invested in technologies and materials that support this transformation. These practices are corroborated by studies such as those by Valente (2014), which highlight the importance of communication mediated by digital technologies in contemporary education.

In this context, teachers act as mediators and facilitators of knowledge. Methodologies such as flipped classrooms, interdisciplinary projects, and problem-based learning (PBL) depend on robust teacher training. According to Freire (1996), teachers must encourage critical thinking and student autonomy, aligning themselves with pedagogical practices that integrate reflection and action. Programs such as the National Pact for Literacy at the Right Age (PNAIC) reinforce ongoing training for educators, while recent studies, such as those by Palú et al. (2020), analyze the challenges faced by teachers, especially in the use of technologies during the pandemic.

Inclusion and methodological flexibility in inclusive practices are essential to meet the diverse realities of students. The National Policy on Special Education from the Perspective of Inclusive Education, for example, seeks to promote methodologies that respect cultural and socioeconomic differences and the specific needs of students (Saviani, 1992). Studies such as those by Oliveira and Cavalcante (2021) highlight how architectural and ergonomic planning also impacts inclusion and student performance. The application of these methodologies requires assessments that transcend traditional tests. Strategies such as portfolios, selfassessments and frequent feedback allow for closer monitoring of student progress and enable adjustments in pedagogical practices (Saviani, 2008). These approaches are advocated by Sanoff (2001) in his studies on school environments and by the National Education Plan, which encourages comprehensive training and practical skills. In the current changes in the world that are constantly transforming, methodologies that promote critical thinking, adaptability and collaboration are essential. In addition to preparing students for the job market, they contribute to the exercise of citizenship and ethical and responsible action in society. These ideas are addressed by Smith (2012) in his study on the impact of acoustics on learning environments and by Toyinbo (2023), who highlights how the physical environment affects academic performance (Palú, Schutz & Mayer, 2020).

# **Environmental Comfort and Ergonomics in the School Environment**

Ergonomics applied to education examines the interaction between school structure and students' physical and cognitive aspects, covering everything from the environment and furniture to pedagogical methods and teaching materials. An inadequate school environment can compromise students' performance and health, highlighting the need for ergonomic and comfortable structures. Recent studies highlight that environmental factors such as temperature, lighting, ventilation and acoustics directly influence learning, highlighting the importance of a school design centered on well-being (Kroemer & Grandjean, 2005; Toyinbo, 2023; Dela Cruz et al., 2023).

It is not only pedagogical resources that determine the success of the educational process. School furniture, adjusted to the anthropometric measurements of students, combined with adequate environmental conditions, promotes not only greater comfort, but also better academic performance. Moro (2005) argues that inadequate furniture can lead to postural and visual problems. Similarly, Kowaltowski et al. (2005) reinforce that thermal and acoustic comfort are essential to maintain concentration and avoid fatigue.

At the international level, initiatives such as the Collaborative for High Performance Schools (Reisslein et al., 2005); Eley, 2006) define a high-performance school as one that adopts contemporary construction and design strategies, ensuring healthy, comfortable, sustainable and safe environments. In Brazil, concerns about environmental comfort and ergonomics in education are reflected in documents such as the Basic Infrastructure Parameters for Early Childhood Education Institutions (MEC, 2006) and the Educational Spaces for Elementary Education: Support for the Development of a Project with Adaptation of School Buildings with an approach and guidelines for projects with accessible and ergonomic educational spaces (MEC, 2002).

- Lighting and Visual Cognition: Inadequate lighting can significantly compromise academic performance and the well-being of teachers and students. According to Millanvoye (2007), insufficient or excessive light causes visual fatigue and disturbances in the nervous system, reducing productivity. Classrooms, as work and learning spaces, must adopt ergonomic standards that ensure adequate lighting to avoid risks (Tavares, 2000).
- Thermal Comfort: Inadequately heated environments affect concentration and alertness. Studies by Kroemer and Grandjean (2005) indicate that excessive heat causes drowsiness and fatigue, while very low temperatures impair performance. Therefore, school buildings should be designed to ensure thermal comfort, regardless of external conditions.
- Acoustic Comfort: Noise interferes with attention, memory and speech comprehension, making learning difficult. NR-17 (2021) highlights the importance of acoustically controlled environments for activities that require constant attention. Studies such as that by Smith (2012), at Sweyne Park School, show that classrooms with good acoustics improve communication and reduce teachers' vocal effort, favoring academic performance.
- Ergonomics and Infrastructure: School furniture must meet the anthropometric needs of students to avoid postural problems and increase comfort. According to Moro (2005), inadequate furniture is responsible for discomfort that compromises students' performance and health. Standards such as those established by the MEC (2006), NBR and the Collaborative for High-Performance Schools (Eley, 2006) highlight that high-performance schools use modern design practices to create healthy and inclusive environments.



Figure 1: Accessibility in the School Space *Notice:* Taken from ABNT NBR 9050 (2015)

## Accessibility and Inclusion

The lack of accessible infrastructure, such as ramps, elevators and adapted bathrooms, still represents a barrier for students with disabilities. Assistive technologies, adapted furniture and inclusive teaching materials, such as those suggested by Conceição and Lúcio (2011), are essential to ensure educational equity. Government programs, such as the Basic Infrastructure Parameters for Early Childhood Education (MEC, 2006), seek to standardize these adaptations in public schools (Santos & Spinelli, 2007).



Figure 2: Space for Inclusion and Accessibility *Notice*: Taken from Rojas & Rodrigues (2021)

# **Impact on the Teaching-Learning Process**

Inadequate environmental physical factors, such as lighting, temperature and acoustics, directly contribute to fatigue, distraction and poor concentration. According to Kowaltowski et al. (2005), improving these conditions directly impacts the performance and well-being of everyone involved in the school environment.

#### **Results and Data Analysis**

The research results were carried out through a questionnaire in a class of 40 students of the technical course in occupational safety at the Federal Institute of Pernambuco, Brazil. Only 21 students responded to the questionnaire. An ergonomic assessment of the classroom was carried out to reach the aspects of comfort, accessibility and the structure of space (Gil, 2019; Marcone & Lakatos, 2017).

In Figure 3, we can observe the space that was analyzed and the comfort aspects (temperature, noise and lighting). The furniture, furniture arrangements and the type of teaching methods applied in the classroom at the school under study were also analyzed.



Figure 3: Structure of the Furniture Organization of the School in Pernambuco/Brazil *Notice*: Records made by the authors (2024)

In Table 1, we present comfort parameters according to the Regulatory Standard – NR-17 and the Brazilian NBR 10152 (ABNT, 1987) registered with INMETRO.

<b>Comfort Parameters</b>	Measured values	Action
Lighting 300-500 lux	235 lux	Perform adjustment
Temperature 20°C - 23°C 68°F - 73.4°F	21°C 69.8°F	No action
Noise Up to 65 dBA	76 dBA	Perform adjustment

Table 1: Assessment of Comfort Aspects in the Classroon
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The parameters are:

- a) The maximum noise level allowed in a classroom is 40 decibels (dB). Anything above this level can cause learning disabilities and vocal problems for teachers. Knowing the possible consequences of a noisy classroom, in which speech intelligibility is impaired, it is necessary to carry out an assessment in the classrooms due to these factors.
- b) The effects of classroom temperature and the ideal effective temperature index between 20°C (twenty) and 23°C and with relative humidity of 40 to 60% were analyzed, where the air speed should not exceed 0.75 m/s, according to NR-17 (2022) and the author Iida (2001). The temperature can cause discomfort and have a direct impact on the development of learning, the ability to concentrate on carrying out activities, as well as fatigue, fainting, dehydration, intense sweating, and headache.
- c) Environmental lighting is fundamental for the performance of activities and NBR ISO/CIE 8995-1 (2013) and NR-17 (2024) determine standards for environments. The environment analyzed in this research was the classroom. NBR establishes the standard lighting for educational buildings between 300Lux and 500Lux for the classroom and that the lighting is controllable, such as: nighttime classrooms, adult education, reading room (Passarin, 2019; Cruz et al., 2024).

In Figures 4, 5 and 6, below, the data found in the response forms (questionnaire) on comfort in the classroom such as noise, temperature and lighting were analyzed.



Figure 4: Analysis and Results: Impact of Noise in the Classroom

The responses indicate that classroom noise affects students' learning qualities in several ways. The main impact identified was difficulty concentrating, reported by 66.7% of participants (14 students). This data reflects the importance of acoustic control in the school environment to ensure adequate learning conditions, as pointed out by Araújo et al. (2018), who emphasize that the physical environment directly impacts student performance.

Other reported effects include difficulty understanding what the teacher is saying (28.6%) and difficulty performing tasks such as reading and writing in a noisy environment (19%). This situation reinforces the findings of Santos & Souza (2020), which indicate that excessive noise compromises both auditory processing and cognitive skills related to reading and writing. In addition, 9.5% of students (2 responses) stated that they lost the desire to pay attention in class, highlighting the emotional impacts of noise, as suggested by Lima and Barbosa (2021).

To mitigate these problems, the literature recommends disciplines such as:

- a) Structural improvements: Implementation of acoustic materials on walls and ceilings to reduce sound reverberation (Souza et al., 2017).
- b) Behavioral management: Encouraging rules of coexistence to minimize unnecessary noise during classes (MEC, 2006); and
- c) Technological resources: Use of sound amplification systems, such as microphones and speakers, to improve audibility (Luckesi, 2011; Amorim & Campos, 2022a).



Figure 5: Analysis and Results: Perception of Temperature in the Classroom

In Figure 06, the perception of the temperature in the classroom, obtaining the following results: Pleasant: 12 students (57.1%); Cold: 5 students (23.8%); Very cold: 4 students (19%). These results indicate that, for most students, the temperature in the classroom is perceived as pleasant, which suggests adequate conditions in terms of thermal comfort for more than half of the interviewees. However, a significant portion of the participants (42.8%) experienced discomfort, either because the environment was cold or very cold, indicating the need for adjustments in the temperature in the classroom.

In the discussion of the results, the perception of thermal comfort is directly related to productivity and learning. According to Souza et al. (2021), the ideal temperature in school environments should allow students to maintain attention without distractions or physical discomfort, which can impact academic performance. When the environment is considered cold or very cold, there may be a reduction in overall comfort and engagement with activities, as suggested by studies by Luckesi (2011).

Studies by Amorim & Campos (2022b) also reinforce that comfortable temperature conditions, whether high or low, affect students' levels of concentration and well-being, especially during prolonged class periods. For 42.8% of the responses that demonstrate discomfort, it is important for the school to make its ventilation or air conditioning systems effective, seeking thermal balance in all rooms in accordance with standards NR-17 (2022) and NBR 16401-2 (ABNT, 2008). Assessing thermal comfort should be an integral part of school planning to improve the quality of the learning environment. Environments with moderate temperatures favor student participation, while thermal extremes can increase feelings of tiredness or demotivation (Araújo et al., 2018).



Figure 6: Analysis and Result: The Impacts of Lighting in the Classroom

Analysis of the data from the graph on the impacts of lighting in the classroom reveals that, among the 21 responses collected, glare is indicated due to the natural lighting of the environment that reflects on the board and due to the lack of curtains or film, which results in excess light. On a smaller scale, 2 students (9.5%) said that the problem is the lack of curtains or film, which suggests that the intensity of natural light may be excessive. Excessive or poorly distributed lighting in the classroom can cause not only visual discomfort, but also eye fatigue, decreased concentration and difficulty in following the activities and content displayed on the board (Silva, Souza & Oliveira, 2016; Ramos & Oliveira, 2017).

Studies indicate that adequate environmental quality is a crucial factor for students' wellbeing in the classroom. As indicated in the studies by Silva, Souza and Oliveira (2016), lighting has a direct impact on concentration and content visibility, and visual comfort is essential for effective learning. According to Ramos & Oliveira (2017), the lack of control and direction of light can affect the quality of lighting, causing discomfort and impairing the learning experience. Controlling the intensity of light directly affects these studies, and can increase the efficiency of pedagogical activities, allowing students to better understand the content. Costa and Silva (2014) state that light control strategies, such as curtains or films, can ensure a more comfortable and safe environment. Therefore, based on the results presented and the references mentioned, it can be concluded that adjustments in classroom lighting, such as the use of curtains, films or indirect lighting, are necessary to improve the quality of the environment and ensure comfort and promote a more inclusive and effective environment so that all students can concentrate and develop their activities.

(THE)

(IIIL)		(D)		
1	Mainta (	Elements used in the space	Elements found	Action
		Teaching methodology applied	Active methodologies	No action
		Types of Arrangement		No action
	A TIME TO A	Flow	Moving difficulty between groups	Adjustment required
(W)				
Indicated area per student (m <sup>2</sup> ) and	Allowed number of students in the	Classroom size and student number	I Intervença	ão

 $(\mathbf{R})$ 

Indicated area per student (m²) and teacher	Allowed number of students in the classroom	Classroom size and student number	Intervenção
1.20 each student	35 students	49 m <sup>2</sup> – 35 student	Necessary intervention
5.00 each teacher	-	-	It should be 25 stds.
			- · -

Figures 7: Teaching Methodology and the Teaching and Learning Process

The teaching methodology applied at the school of study at the Instituto Federal de Pernambuco (IFPE), on the Abreu e Lima Campus, is characterized by elements typical of active methodologies. The focus is on developing pedagogical practices that promote procedural, formative and continuous learning. These practices prioritize activities that involve investigation, confrontation and problem-solving, establishing an environment in which the student assumes a role and is encouraged to solve real problems and build knowledge through interaction and practice. The number of students in the classroom can also hinder involvement in the teaching and learning process as well as in the teaching method applied (Riffel & Malacarne, 2010; Bacich & Moran, 2017).



Qual tipo de arrumação das carteiras gostaria de ter em sua sala de aula?

Figure 8: Analysis and Results: Chart on Desk Arrangement

The research sought to understand students' preferences regarding the arrangement of desks in the classroom. Of the respondents, 21 opted for the traditional model of chairs in rows facing the teacher. This number reflects a significant acceptance of conventional arrangements, which prioritize an organization centered on the teacher as the main transmitter of knowledge. The row model is widely used for its practicality and for facilitating individual concentration, reinforcing teaching methods focused on expository classes. Despite its functionality in traditional settings, this arrangement can limit interaction and the application of active methodologies, which require greater flexibility in school environments. Thus, its popularity highlights the balance between tradition and functionality in the educational environment. This configuration is also frequently adopted due to factors such as physical space limitations in many schools and the Brazilian educational culture, which historically values hierarchical structures centered on the figure of the teacher as the main mediator of knowledge.

This arrangement tends to hinder collaborative activities, such as group work or debates, restricting the implementation of active methodologies that favor student participation and the development of skills such as critical thinking and communication. Furthermore, in inclusive contexts, classrooms organized in a fixed way may not adequately meet the needs of students with disabilities, compromising accessibility and equity in learning (Luckesi, 2011; Amorim & Campos, 2022b; Souza et al., 2021).

Studies suggest that alternative formats, such as circular or U-shaped arrangements, promote greater interaction and engagement, facilitating both collaborative learning and inclusion (MEC, 2006). In this sense, adopting mobile furniture or flexible environments that can be quickly rearranged allows for different pedagogical activities and teaching styles to be met. In addition, adapting the physical space to new pedagogical and technological demands contributes to the creation of a more dynamic, inclusive and innovative educational environment (Araújo et al., 2018).



Figure 9: Analysis and Results: Learning Difficulties in the Classroom

Analysis of the collected data reveals the main factors that hinder learning in the classroom.

The results show the following panorama: Desk discomfort: This was mentioned by 13 students, representing 61.9% of the responses. This data highlights the inadequacy of school furniture as the main problem faced by students, reinforcing the importance of investments in ergonomics to improve well-being and academic performance (Moro, 2005). Lack of internet access: Cited by 5 students, equivalent to 23.8% of the responses. This issue reflects the need for connectivity in a teaching environment increasingly integrated with digital technologies, especially for research and access to support materials (Freire, 1987; Souza et al., 2021). Lack of equipment or staff: Mentioned by 2 students (9.5%), this problem highlights gaps in the school infrastructure that can limit the practice of modern and interactive pedagogical activities (Sardinha et al., 2017; Vasconcelos et al., 2021; Souza, 1998). Desk arrangement: Only 1 student (4.8%) pointed out this factor as a difficulty. Although it is a minority, this response may reflect the perception that more dynamic or collaborative arrangements can improve interaction and learning in the classroom (Luckesi, 2011; Bacich & Moran, 2017).

Therefore, the graph shows that most of the problems are related to the physical environment and infrastructure, with uncomfortable desks being the biggest obstacle. This finding reinforces the need for adaptations in school furniture to meet different body types and improve ergonomics (ABNT, 2021; NR-17, 2022). In addition, connectivity and the provision of equipment should be prioritized to align teaching with contemporary demands. Finally, although the arrangement of desks was rarely mentioned, it complements the reflection on how the physical environment can influence the teaching-learning process. These data suggest that structural and technological interventions are essential to create a more inclusive and efficient environment, aligned with the needs of students.

Structural safety aspects / accessibility	Intervention	Action
Tactile floor	Yes	Install tactile flooring
Signpost	Yes	Install signpost
Accessible door 0.90m wide	It needs adjustment	Install accessible signage and latches
Mural 1m from the floor	Yes	Install mural
Wall and floor contrast	It needs adjustment	Paint wall contrasting with floor
Height from floor to blackboard 1m	Not necessary	None

Table 2: Assessment of the Space With Regard to Structural Safety/Accessibility

Installation of Tactile Flooring. According to NBR 9050 (2020), the installation of tactile flooring is essential to ensure accessibility for people with visual impairments. Tactile flooring should be applied in circulation and direction-changing areas to facilitate safe movement. The proposal to install tactile flooring is aligned with regulatory requirements. This intervention is crucial to promote the inclusion and autonomy of users with visual impairments, ensuring that they can move safely through the space. The installation of adequate signage, according to the guidelines of NBR 9050 (2020), is essential to guide and inform all users of the space, especially those with special needs (Law 13,146,2015; Costa & Souza, 2019).

#### Conclusion

This study reinforces the importance of adapting school buildings to meet the social, cultural and educational demands of the 21st century, with a focus on accessibility, inclusion and environmental comfort. The analysis of school spaces revealed the need to invest in adequate infrastructure and adopt innovative teaching methodologies, which are essential steps to ensure the integral development of students and a more equitable education. These initiatives need to be aligned with contemporary pedagogical demands, promoting a physical space that stimulates concentration and well-being. Finally, the implementation of structural and methodological improvements requires collaboration between schools, administrators, authorities and governments. Only with sets of exercises will it be possible to create an educational system that fully meets the needs. It is crucial to emphasize that classroom configurations must not only meet infrastructure and comfort standards, but also align with emerging pedagogical practices that promote active and collaborative learning. For example, the use of flexible and adaptable spaces allows the implementation of methodologies that stimulate student engagement and participation in practical activities. Furthermore, engagement is another relevant point and the need for public policies that encourage continuous funding for improvements in infrastructure and teacher training, allowing schools not only to correct flaws but also to innovate in teaching processes. In this way, it becomes possible to meet the diversity of students and the different learning demands in the contemporary context. Therefore, the path to inclusive and quality education requires joint efforts to create school environments that are safe, comfortable, and pedagogically and technologically advanced. Only in this way will it be possible to meet the expectations of the 21st century, ensuring that each student has the opportunity to reach their full potential in a space that promotes well-being and effective learning.

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## Inclusive Making: Learning to Design With and for Neurodivergence Through Participatory Making

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#### Abstract

This paper illustrates an outreach project that explores Inclusive (Participatory) Making between students of Universal Design and young adults with neurodivergence, who are trained in life skills by host organizations. Here, making refers to the exploration of tangible materials, media, and crafting techniques and is used as a methodology for being an intuitive and democratic form of expression known to mankind. Art-craft workshops were coimagined by the design educator (me), design students and special educators to uncover the creative diversity among these atypical individuals. The workshops led to a first-hand understanding of neurodivergence, helped identify comfort levels with materials or techniques, and gauge their skill sets. The creative outputs were analyzed to create skill maps for every participant. The above study was then used to design an aesthetic vocabulary that celebrates atypical sensibilities, which were used to design products that the skill-training organization could produce and retail to create a viable business. By questioning what constitutes creativity, aesthetics, and authorship, we were able to alter the brand perception of enterprises working with people with disabilities, thereby shifting the gaze from charitydriven to design-driven, making it an inclusive livelihood opportunity for a community that is conventionally unable to be self-reliant. It gave the prospective designers scope to expand their practice to accommodate vulnerabilities and differences and to imagine alternate. unrestrained narratives of aesthetics. This ability to unpack, critically question, and respond to a social phenomenon was scaffolded by an experiential creative pedagogy, developed to be collaborative, compassionate, infusive and inclusive.

Keywords: Inclusive, Making, Participatory Design, Neurodivergence, Design Education, Design Pedagogy, Livelihood Generation

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## Introduction

"It is justice, not charity, that is wanting in the world", said Mary Wollstonecraft in the context of women and equal opportunities, but it holds as true for persons with disabilities (PWD) and their right to lead a meaningful life of dignity, without being at the societal margins.

As per the Census 2011, 2.21% of the population in India is categorized as disabled, of which close to 9% falls under the category of 'mental retardation' and 'mental illnesses' with estimated 2 million people listed as neurodivergent as per National Institute of Mental Health and Neurosciences (NIMHANS).

Of all groups of people with disabilities, those with mental retardation have the highest rate of unemployment, at 94%, as per the National Sample Survey Office (NSSO).

Viewed in this perspective, persons with disability represent the single largest combined minority group in India. (Shenoy, 2011). Globally, the figures are equally disheartening; 80% to 90% of PWD of working age being unemployed in developing countries, and between 50% to 70%, in industrialized countries as per the United Nations factsheet on PWD.

The employment playing field is uneven, inaccessible, and inequitable for this community. The social perception surrounding disability as a burden is the first step towards establishing a person's unequal status. This coupled with economic frameworks that only support high-functioning individuals, inadvertently act as barriers for people with disabilities, thereby reducing their chances of showcasing their economic worth and living a self-sustained life with dignity.

Despite India's strong legislative frameworks and economic rehabilitation plans, the implementation of these strategies is yet to become a reality. It becomes particularly difficult for the neurodivergent population, where the complexity of the condition is not always as perceivable as physical disabilities.

Some NGOs over the years have contributed to the upliftment of this marginalized population through supported or sheltered forms of employment and economic rehabilitation programs.

A significant part of these programs includes vocational training in areas of hospitality, digital skills, and craft activities that involve paper bag production, paper-mâché crafts, chocolate and candle making alongside sorting, boxing and packaging. However, across these formats, the neurodivergent person is part of an assembly line and paid a wage proportionate to their efforts.

These organizations rely on small-scale fairs and seasonal corporate gifting as revenue streams for their enterprises to stay afloat.

But what these enterprises really rely on is people's sympathy to make these purchases. A quick look at the webpages for some well-meaning organizations that work with people with disabilities have a pleading tone of voice and the helplessness is palpable.

But what if creative thinking could change the charity-first (and in this case also the disability-first narrative) to a design-first narrative, for a more equitable livelihood landscape?

This would mean that Design or Creative Education should have equipped prospective designers with the necessary capabilities to bring about such shifts.

It is then that one realizes what design education does not teach.

Primarily, most design curriculums exclude or skirt around financial literacy and any economic know-how.

How then does one learn to design for a livelihood or to earn money? And if one doesn't know how to design for livelihoods for oneself, how would one do it for someone else?

But designers are expected to design for someone else all the time and if pursuing a specialized discipline such as Universal Design, we expect them to make life easy for everyone, including and especially for the vulnerable population, such as people with neurodivergence, who live at the fringes of societal existence.

Secondly, design education prepares designers to design 'for' a context or a target audience, but seldom 'with' them in an equitable manner. Link this to the concept of intellectual property or protecting one's creative capital and suddenly, design education presents an interesting conundrum. While it instils a sense of self-preserving, individualistic mindset, it must be in the service of others.

As a response to the above challenges, I developed an outreach course on the Economic Sustainability of People with Neurodivergence, for the students of Universal Design at the National Institute of Design, Bangalore, India. The tenets of Inclusive pedagogy were used to scaffold the course design and the pedagogy, to make the dynamics between the students and the teacher more humane.

As a part of this course, we collaborated with two organizations in the city of Bangalore, across two years, Chiranthana and Diya Foundation respectively, that work with young adults with neurodivergence.

These organizations provide life-skill training to neurodivergent young adults, aiding in employability and involves them as a part of an assembly line to create partially hand-crafted products.

The next section will elaborate on the project in the form of a case-study.

## Economic Sustainability Through Participatory Making: Course as a Case Study

This section will outline the details of the methodology, the lens and lines of inquiry that provide the rational for why the course was imagined the way that it was, the course design itself, the nature of collaboration as well as the impact from such an outreach exercise that blends social realities with creative education.

## The Methodology

The methodology adopted was an amalgamation of methods and devices, such as participatory design and making, bounded by the ideal of inclusion, by honouring differences (and not deficits), to create well-suited livelihood opportunities with the marginalized group, as equal partners in the process.

Hence it would be safe to ascribe the term 'Participatory Making' to the methodology; where the act of making becomes an unthreatening, collaborative, and generative instrument to give voice and harness collective creative intelligence, thereby also earning the extended name of 'Inclusive (Participatory) Making'.

### Why Making as a Medium?

Making in this context refers to everything from mark-making to material and technique manipulations. The act of making has historically been a way for humans to make sense of the tangible, materially mediated world around us, thereby becoming one of the most intuitive and democratic means of expression, discernment, and living.

### Why Participatory Making?

Reflecting on our everyday activities tells us that making brings people together; from quilting to pasta-making, it only works when people collaborate, share resources and experiences, where the resultant artifact becomes a patchwork of knowledge.

Additionally, making can be very centering, where the mind, hands, and the senses mindfully engage with the material one seeks to manipulate.

In the context of neurodivergence especially, it acts as a tool 'to mitigate the lack of reciprocity in cross-neurotype interactions' (Davis & Crompton, 2021). In other words, when two different neurotypes interact, there may be difficulty in communication and alignment, and here making becomes a bridge between them.

This undeniably renders making to be one of the most inclusive and non-stigmatizing tools of dialogue.

## The Lens & Lines of Inquiry

This course relies on critically questioning the popular narratives around the conceptual holy trinity of Creativity (and the creative being), Aesthetics (as its associated outcome) and Authorship (as claiming of ownership).

As a cohort we were driven to ask:

- Who is creative and who is not?
- What is beautiful or aesthetic and what is not?
- Who decides the dominant aesthetic narratives of the everyday?
- Who gets to claim intellectual and/or economic authorship, if the seed of an idea comes from one, but another realizes it, making it visible and viable?

Questioning these concepts coupled with unorthodox artful explorations, helped build a case for the creative capabilities of people with neurodivergence, making way for the acceptance of aesthetic plurality and leveraging this sensibility to generate economic value.

As a design educator in the discipline of Universal Design, my inclination towards Inclusive Pedagogy (IP) and Universal Design for Learning (UDL), have been the most congruous pedagogical choices.

Over the years and especially throughout this course, acknowledging & embracing socialcultural-intellectual diversities in my own classroom and creating differentiated opportunities for learning and participation for the different kind of minds has been rewarding.

Some of the measures taken were as follows:

- Differential instruction design that are oral-aural and visual.
- Expanding the notion of the classroom as a learning environment to be more alive or experiential.
- Decentralizing and democratizing the decision-making process for every step, thereby flattening the hierarchy.
- Designing a self-assessment framework that provides autonomy to the learners to reflecting on their practice more critically and therefore become more in control of their learning journey.

## The Collaborators

The key players in this outreach initiative have been the students of Universal Design from NID, batches of 2021 and 2022, the design educator (me), the founders of the two host organizations, Ms. Rachana Prasad from Chiranthana and Ms. Suman John from Diya Foundation-Innovations with their teams, respectively, the core group of the neurodivergent young adults from these organizations and Ms. Devika Krishnan, as an external consultant, for her knowledge of mobilizing craft-based communities towards creating equitable businesses.

At every stage, it was a partnership between two to three of the above-mentioned groups of people, with certain stages where all groups were meant to intersect and contribute as well.

## The Course Design

The course has been designed to be an outreach, collaborative journey with one organization at a time and runs for 3 weeks. The trajectory of how the course unfolds across 9 phases can be seen in Figure 1.

The yellow phases are those that take place in the backend at the level of the classroom, whereas the green phases are the ones that take place in the context of the organizations, making the classroom itself toggle between two very different spaces and states, alongside the changing scale of collaborators in each space.

Building Awareness & Understanding	Co-visioning with Organization(s)	
6	0	3 Co-creation & Implementation of Workshop
Mapping the Market	Workshop Sensemaking	
6	0	8 Business Viability
Visual Language Curation & Aesthetic Recalibration	Prototyping & Validation	
Within institutional setup		9 Student Reflections
Expanded classroom-At the NGO		

#### Figure 1: Course Flow

#### **Phase 1: Awareness Building**

This phase includes gaining a theoretical understanding of the following:

- Economic sustainability and neurodivergence across diverse resources
- The link between the two concepts
- Methodology adopted by local-global organizations that work towards fulfilling the vision of livelihood generation cum economic empowerment of people with neurodivergence

#### Phase 2: Co-visioning

Co-visioning phase is a meeting of the minds. It takes place between the design educator, the students of design, the external expert and the members of the host Organization, including their accountant and includes the following:

- Understanding the vision, mission, organization structure, and capabilities of the decision-makers
- Auditing the product portfolio, processes, and the participation levels of the core group (neurodivergent young adults)
- Sharing of knowledge cum expectation between key influencers

Plotting and auditing each craft process in detail and the involvement levels of the core group is done to

- a) see the link between their involvement and their corresponding income and
- b) build a case for product portfolio recalibration that meets the market needs but also leverages the capabilities of the participants instead of being a cog in the wheel.

#### **Phase 3: Co-creation & Implementation of Workshop**

This phase requires the design students to co-develop a series of generative workshops in consultation with the founder, resident art therapist or art teacher, a clinical psychologist and the design educator.

The workshops are run across 2-3 days with the core group, depending on their emotional readiness as well as the convenience of the host organization.

The workshop activities are carried out with and without prompts, which may range from words to situations, from artifacts to photographs, to even a piece of music. The design students are encouraged to embrace uncertainty, surprises and happy accidents, to acknowledging the need for departures from their original planning, depending on what the situation demands.

The activities include drawing or mark-making, paper folding-cutting or stencil-making, mosaic making using paper, cloth & found materials, clay-modelling, tie-dye with natural dyes, some frame-loom weaving, braiding, crocheting, embroidery, among others as seen in Figure 2.



Figure 2: Workshop Activities

## Phase 4: Workshop Sense-Making

Post conducting the workshops comes the sense-making phase.

This is when every core group individual, their abilities, interests and challenges are mapped, alongside a list of pre-determined parameters for every activity conducted. The parameters may vary between the activities, and they range from task comprehension to sense of autonomy, choice of medium, imagery or method, attention to detail, co-working ability, all the way to socio-emotional response to multiple sensory inputs, to name a few.

The observations and findings are collated as descriptive, tabular as well as radar charts, as seen in Figure 3 and are also cross verified for accuracy with the resident therapist. Over time, different ways of representing qualitative data surrounding the skill-sets of the core group have been explored, to do justice to the range of capabilities that any given individual may demonstrate through these creative activities and so that these data points are easy to grasp for the support group at the organization, based on which necessary measures can be taken in an informed manner.

Mosaic





Drawing



Figure 3: Skill-Mapping for Individuals From Core Group of Participants

Additionally, this phase also includes

- Digitization of the artworks or material manipulations generated from the workshops
- Curation of a phygital library of these visual plus tactile elements after peripheral clean ups, to understand the diversity in visual language and thought processes

While attending to this entire phase, the design students

- a) begin to understand the role of process vis-à-vis just the output, which makes them more critical of their own creative practice and
- b) become acutely aware of their position of power, striving to keep biases to the minimum and suspending judgement, when analysing someone else's creative output.

#### **Phase 5: Market Analysis**

This phase requires the design students to understand the lifestyle product market, the prevalent trends, consumption patterns, identify opportunity areas and thereby redefine the target audience that the host organizations would benefit from catering to.

#### Phase 6: Visual Language Curation & Aesthetic Recalibration

Having understood the market landscape, we move to the most challenging yet the most creative-generative phase of the course.

This is where the visual language for the overarching brand and the product portfolio within it are imagined as mood-boards, based on the perception one wants the brand to create, which would set it apart from its counterparts.

Equipped with a brand perception vision, a know-how of the capabilities of the core-group, coupled with the infrastructural realities and aspirations of the host organization as the basis, new product lines are explored as low fidelity mock-ups.

This new aesthetic is created by dipping into the phygital library curated in the previous phase and is applied across different product ideas, from the graphical to the tactile.

In some product lines, a digital printing route is taken to do away with the inconsistencies that come with being handmade and to aid reproducibility, while keeping the signature motif of the artist intact.

Some examples of aesthetic anchors and the corresponding new product lines are described below:

- a) The drawings, doodles, and patterns generated are used as the primary motifs for a series of digitally printed cushion covers, a memory game and a board game that takes the player on a journey around the city of Bangalore.
- b) Character doodles are extracted to create a range of cloth dolls and mobiles.
- c) Dyeing techniques like tie-dye with an overlay of digitally printed drawings come together as surfaces that can used on bags, notebook covers, laptop sleeves etc.
- d) Surface manipulation techniques such as cut-outs are graphically manipulated to be digitally printed as surfaces that can be used as cushion covers, notebook covers, laptop sleeves, or even as patches on apparels.
- e) A phrase repeatedly used by one of the participants, 'I draw...' becomes a prompt to develop an entire range of reusable drawing tiles, that have this phrase on top and the user is encouraged to explore in the space below. Some of these ideas can be seen as a collage in Figure 4.



Figure 4: New Product Ideas

## Phase 7: Prototyping & Validation

Following a few rounds of deliberation and critiquing, the most promising ideas are converted into medium to high-fidelity prototypes, using the available and in some cases prospective resources and facilities. Each product promises to be accompanied by a label that would carry the name of the neurodivergent individual, thereby establishing their identity as artists, who incidentally are atypical.

The core group participants along with the various stakeholders are invited to a viewing and feedback. The reactions and responses from the participants serve as gratification, particularly when the participants recognize their artworks amidst the array of new product explorations and that happens because the essence of the original works are maintained to the maximum extent possible.

A final catalogue with design specification sheets for each new product is compiled, for ease of production and the meeting of quality benchmarks.

### Phase 8: Business Viability

In tandem with the final prototyping phase, the students also attend to the business dimension of the initiative. An elementary-level Business Model Canvas (BMC) is drawn up to unpack the viability of the interventions, as a roadmap to building a sustainable business for the enterprise.

Along with the BMC and the catalogue, rough costing sheet for each product and an indicative vendor list are handed out to the host organization to facilitate their production capability, depending on their size and scale of operation. Additionally, a digital resource library is furnished so that the organization may be able to dip into this pool to be able to generate newer ideas going forward and thereby future proofing their product portfolio.

It is important to note that the idea is not to judge the students for the accuracy of the use of the BMC framework but to acclimatize them with the economic as well as strategic facets of designing for business.

#### **Phase 9: Reflection on Action**

While the collaboration comes to an end with all the materials and deliverables being handed over to the host organizations, our journey as a design-led cohort of students and educator has one more milestone to conquer, the reflective self-assessment.

As a pedagogical tool, I have always shared detailed reflective self-assessment documents with my students, which are tailor-made for each course I teach. These documents are designed to elicit both qualitative and quantitative responses with respect to the teaching-learning journey of the students. Apart from being deeply introspective for the students, they also serve as a feedback mechanism for me as a teacher.

An excerpt from one of the forms reads as follows:

"As design students, we need to step out of our comfort zones and extend our empathy beyond the walls of our studios. Collaborations like these give us a more grounded and realistic approach to our projects. They challenge our idealism and bring new perspectives that add value not only to our academic work but also to people's lives.

Participating in such projects not only helps us improve our confidence and judgment as designers but also allows us to see how our academic learning can be implemented in real life. It helps us develop new research methodologies and processes, expands our worldview, and makes us better design practitioners."

## The Impact & Findings

The impact of an initiative like this, which is both participatory and inclusive is difficult to ascertain based on a short-lived series of actions and their efficiency levels.

Instead, they may be better understood through more qualitative indicators of transformation in areas such as power-skill-expectation-ownership distribution over time, along with a deepened sense of collective responsibility and one's ability to critically reflect on what it means to be truly inclusive in one's practice.

Keeping the above as the point of reference, the transformations during and after the project have been illustrated as certain attitudinal as well as operational shifts for each of the key stakeholders who participated, namely the design students or aspiring practitioners, the design educator, the neurodivergent or atypical participants who were the primary beneficiaries and the NGO team who operate as social change-makers.

For the design students or prospective practitioners, the shift was in the following areas:

- Their position of privilege had been exposed and it paved the way for them to engage with authentic allyship with a group of atypical minds, the likes of which they have never encountered.
- Some of the neurodivergent students felt their personal, lived experiences and realities being acknowledged and accommodated through the initiative.
- This was the only occasion in their academic journey, where they were negotiating authentic participatory methods with a gaze of 'difference' and not 'deficit'.
- This also allowed them to operate with an opportunity-centric design process vis-à-vis the conventional problem-centric approach.
- They learnt to be participatory without being patronizing, training themselves to oscillate between providing support & letting go.
- They had cultivated the ability to 'design with' instead of 'designing for' in their practice.
- A deliberate attempt was made to reflect on, question, and reframe creativity by embracing aesthetic plurality, all the while partaking in a form of creative education that is institutional and certifies one as a creative practitioner.
- They were suddenly foregrounding authorship for those who cannot champion for themselves and thereby flipping the Intellectual Property (IP) conversation; from being designers who usually focus on protecting 'personal' IP rights to becoming advocates for 'collective & equitable' IP rights.
- They were now equipped to link creative practice to management practices and eventually business and therefore felt prepared to design for businesses.

For the design educator it was about:

- Changing hats and corresponding roles at regular intervals; from being a teacher one moment to a co-participant in the next, from the design consultant on few occasions to being the negotiator across various phases of the collaboration.
- Negotiating notions of the classroom; from the familiar, controlled and walled to the unfamiliar, uncertain, realistic, and experiential contexts of the host organizations as a porous classroom.
- Experiencing reflexivity with Inclusive Pedagogy; from teaching about inclusivity while employing it as a pedagogy to do so.
- It was an opportunity for me as the educator to acknowledge and embrace socialcultural-intellectual diversities in my own classroom, while equipping the design students to do the same in their context of work and witnessing the dynamics of those interactions.
- Some of my students with clinical neurodiversity (ADHD & autism) were operating from a place of empathy, acting as a bridge between the participant group and their peers.
- From helping the design students to engage in more sensitive ways, flagging potential discomforts, drawing authentic insights from observations to developing frameworks for skill mapping, using authentic markers of evaluation.
- Reading between the lines of the self-reflective framework, where the responses in them served as critical feedback. Sometimes serving as prompts to recalibrate certain decisions, while at other times acting as a source of validation and gratification for the pedagogy, which has been a vehicle to instil values in the aspiring practitioner minds.

For the neurodivergent or atypical young participants, there were visible changes concerning:

- Societal integration: where they were able to forge relationships with the once unfamiliar design students, in an uninhibited and unthreatened manner, mobilized by a common love for making, crafting and just imagining freely.
- Creative autonomy and confidence: they were enjoying the act of creating across various activities, no longer striving to be careful or perfect. Instead, they were being encouraged to just imagine, while gathering appreciation for their visual-tactile vocabulary, which was finding real life applications.

If this sentiment could be summed up in one line, it would read as follows: "I make things the way I see the world, let me show you how I see the world".

Going forward, one can hope that this would lead to the following:

- An identity shift: from being dependent and feeling sub-ordinate to feeling empowered as creative individuals, who can earn their living with dignity, for precisely who and how they are.
- Equitable authorship through social-professional integration: from their token participation in an assembly-line to becoming an artist-designer with a unique visual language of their own and being treated at par with the 'trained' creative practitioners who dovetail their expertise with those of these 'intuitive' creative practitioners.

Lastly, for the NGO Team of change-makers, it was about:

 Experiencing the power and reach of design, witnessing the blueprint for how designers think and understanding the many forms of design, from designing of research, processes, products all the way to buying behaviour and business strategies. But most importantly, what happens when inclusivity as a philosophy meets design-thinking.

- Shifting the gaze inward; from relying on digital reference libraries (Pinterest or Instagram) to leveraging the creative potential of the living libraries they work with on daily basis. That way they could create a unified visual language with aesthetic diversity within it, to make the brand distinctive, refreshing and be relevant over time. Especially with AI taking over the world of image-making, this would be the biggest differentiator for these enterprises.
- Unexplored alliances: where collaborating with educational institutions across disciplines can be a symbiotic model to harness resources (people, knowledge, skills, and time). And for the educational institutions to expose the learners to societal realities, would be a preparation to work towards social change and develop fullcitizenship abilities.

The hope is that these attitudinal-behavioural and operational shifts would pave the way for systemic transformations in institutions, social enterprises and commercial entities alike, with economic empowerment of the marginalized groups as one of the most desired ripple effects.

#### Conclusion

The collaborative outreach project between students of Universal Design and young adults with neurodivergence to create livelihood opportunities, has cemented the role of design as a practice, that can alter prevalent narratives, whether social, ecological, emotional, aesthetic or even economic.

It has demonstrated that if design and foremostly design education were to expand its reaches to include people with vulnerabilities, neurodivergence being one of them, it could alter the charity-narrative usually associated with this (and other such) underserved population, to an empowered design-driven one, by providing creative opportunities for livelihood generation, leading to the economic security, upward-mobility, and quality of life. This social permeability would make design a truly inclusive and accessible practice.

Given the backdrop of vocational skill training employed by most NGOs working to support this population, we were primarily exploring 'Participatory Making', an amalgamation of participatory design and making, to create joyful, well-suited livelihood opportunities with the marginalized group, as equal partners in the process, thereby also gaining the name of 'Inclusive (Participatory) Making'.

Here, the act of making served firstly as an unthreatening tool for dialogue, bridging the gap between different neurotypes and secondly, as a generative instrument to lend a creative voice to a group that is conventionally not reckoned with having an aesthetic vocabulary and thereby harnessing collective creative intelligence, as they explored different materials, media and techniques.

The role of the design students was to dovetail their expertise with those of these 'intuitive' creative practitioners, or in other words to simply polish and make visible the underlying aesthetic. The dynamics of the relationship between these two kinds of creative practitioners (the trained and the intuitive) became equitable as we critically examined the conventional concepts of creativity, aesthetics and authorship of the creative output very early on.

To sum up and provide a generalized way forward, this outreach project was our way to demonstrate that the desired shift in the practice and impact of design geared towards socioeconomic transformations can best be brought about foremostly at the level of design education itself and may be done in the following ways:

- a) Ensuring that formal design education recognizes the unpopular and underrepresented sections of the society and brings these uncomfortable realities to the classroom or alternatively, takes the classroom to the real world; making a case for experiential and inclusive learning, where diverse environments, circumstances, people and their abilities are acknowledged and embraced as a part of one's academic journey and endures as a disposition thereafter.
- b) Employing a pedagogy that is truly inclusive and compassionate and allowing for reflexivity to guide the teacher.
- c) Using a participatory approach to train the prospective designers in the art of designing 'with' and not just 'for' the realities and those that live them.
- d) Anchoring ones gaze to embrace differences instead of foregrounding perceived deficits, to inform all forms of actions and interventions.
- e) Expanding the notion of design itself, from developing a course, the instructions, and pedagogy as one would design for experiences to generating frameworks to evaluate not just the course output but the teaching-learning experience itself with due attention to qualitative shifts in perception and ensuring that values endure with the learners well after the education is complete.

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## Internationalisation-at-Home in Chinese Universities: Contradictions and Potential Changes

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#### Abstract

Internationalisation at Home (IaH) is a new trend in Internationalisation of Higher Education (IoHE). Starting with China's emergence as a major international education player, the study evaluates the student experience of IaH in two Chinese higher education institutions, exploring the underlying values, purposes, and approaches. Two qualitative case studies were conducted, with 29 semi-structured student interviews. They were analysed through the lens of Activity Theory to identify the contradictions driving change. The analysis reveals that students perceive IaH as a driver for education reform, including curriculum transformation, student and academic development, income generation enhancement, university reputation improvement, and inclusive education. Activity Theory is shown to have enabled the identification of contradictions. These include the tension between personal development expectations and industrial needs, the superficial nature of IaH implementation when restricted to specific departments like an International Office/School, differing cultural and educational expectations and practices, and the role of traditional practices in blocking the reform process. These contradictions illustrate the complex interactions between student aspirations, institutional strategies, and the broader educational and industrial landscape. The Activity Theory framework demonstrates key social-cultural and contextual elements central to education reform. It identifies considerations in implementation of IaH strategies. This is the first use of Activity Theory to evaluate the relationship in IaH between higher education reform, goal setting, social and cultural norms, industrial expectations and internal roles and responsibilities. The research has generated new understandings of how IaH can be extended to other developing countries.

Keywords: Internationalisation at Home (IaH), China; Activity Theory, Higher Education, Educational Reform and Development, Internationalisation of Higher Education (IoHE)

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#### Introduction

Internationalisation has come to be seen as a key change agent in tertiary education, in highincome societies but also among middle- and low-income ones (de Wit & Altbach, 2021; Jones & de Wit, 2012). Internationalisation has varying socio-economic, cultural, and technological impacts depending on context (Maringe et al., 2013), as well as political, economic, social-cultural, and academic rationales (de Wit, 2002).

The focus of Internationalisation of Higher Education (IoHE) has historically been on "internationalisation abroad": the small subset of students who can take advantage of international mobility (de Wit, 2020). Internationalisation at Home (IaH) is new trend in response to the need to ensure that domestic students can receive an international higher education experience even if they do not study abroad (Harrison, 2015). The term can be defined as "purposeful integration of international and intercultural dimensions into the formal and informal curriculum for all students within domestic learning environments" (Beelen & Jones, 2015, p76). This has become increasingly important, as restrictions are placed on mobility, certainly after the COVID-19 pandemic (de Wit & Altbach, 2021), but also through the impact of the sustainability agenda. Much of the existing research on IaH has taken place in North America (e.g. Agnew & Kahn, 2014; Soria & Troisi, 2014) and Europe (e.g. Almeida et al., 2019; Robson et al., 2018). Insufficient attention has been paid to developing counties and Asian contexts, especially China, where IaH has grown rapidly (Guo et al., 2022). It is therefore of value to extend the current discourse to include this perspective.

China is suitable for this study because it exemplifies one of the most effective models of internationalisation of education in developing countries, with an increasing international reputation (Harrison, 2015). The development of contemporary Chinese higher education has been significantly influenced by internationalisation (Xu, 2023). Even though the prevalent definition of internationalisation uses Western discourses and attempts, China has unique characteristics in this area (Xu, 2023). Its success is evident in its ability to attract foreign professors, educators, and students from various countries (Harrison, 2015). Liu (2021) effectively encapsulates these points, drawing from interviews with professionals engaged in internationalisation in China. Liu presents a Chinese perspective on internationalisation in higher education as a coordinated national effort, integrated at the institutional level, aimed at adopting Western-led global standards in teaching, research, management, and facility development. This is achieved by exposing academic staff, students, and administrative staffs to Western practices. An increasing number of Chinese higher education institutions and projects have established "Sino-foreign cooperative education" institutes. These educational initiatives are jointly organised by foreign and Chinese educational institutions in China, with a primary focus on enrolling Chinese students (Zhang, 2023).

Academic and disciplinary structures shape the approach to internationalisation in distinct ways (Alexiadou et al., 2024). Internationally (Cannon & Djajanegara, 1997), the "hard" (Science, Technology, Engineering, and Mathematics (STEM)) sciences usually attain higher levels of internationalisation than "soft" subjects (i.e. humanities and social sciences). For internationalisation, "Hard" sciences focus on technology development and research and knowledge base reinforcement, while "soft" sciences focus more for enhancing critical thinking and deliberation (Alexiadou et al., 2024). This study mainly focusses on STEM discipline.

In order to understand the factors driving and inhibiting the development of IaH in this context, this research evaluates IaH in two Chinese higher education institutions, exploring the perceptions of students, through the following research questions:

Q1: How are the perceptions of Internationalisation at Home in Chinese higher institution?

Q2: What are the contradictions and changes that occur as IaH is implemented?

#### Method

A qualitative methodology was adopted for this study, with 29 semi-structured interviews allowing exploration of participant's true feelings on complex issues to be explored (Gummesson, 2005).

The study consisted of two case studies in PRDU and GXPU. Both PRDU and GXPU are Universities located in non-first-tier cites which focus on STEM subjects, expanding their international presence and educational capacities through IaH. However, they have distinct characteristics and strategic focuses. PRDU benefits from being in a major economic hub, likely offering greater opportunities for students in industrial and economic sectors post-graduation. GXPU is located in a more rural area but is still in an industrial town. Both universities are keen to internationalise their campuses and have included Sino-foreign cooperative education, but PRDU has established a dedicated school. The choice of these two allows different perspectives to be examined by contrasting the city and economic background.

Interviews were held via WeChat voice calls due to the preference of participants. The interviews were conducted in either Chinese or English, depending on the participants' preference, to ensure they felt comfortable expressing their thoughts clearly in the language of their choice. 28 local participants chose to speak Chinese while one international student participant chose English. Participants were named as PR1, PR2 ... and GX1, GX2 ... for anonymity and confidentiality. This study adopted thematic analysis (TA) using NVIVO 14 on the English translations of the Chinese transcriptions.



An Activity Theory framework was used to interpret the data. The *Eight-Step-Model* (Mwanza, 2001) was used, incorporating open-ended questions to generate and interpret the components of the AT based on the grounded theory.

Table 1: Eight-Step-Model (Mwanza, 2001)			
AT Components	Identification		
Activity of interest	What sort of activity am I interested in?		
Object or Objective of activity	Why is this activity taking place?		
Subjects in this activity	Who is involved in carrying out this activity?		
<i>Tools</i> mediating the activity	By what means are the subjects carrying out this activity?		
<i>Rules</i> and regulations mediating the activity	Are there any cultural norms, rules or regulations governing the performance of this activity?		
<i>Division of labour</i> mediating the activity	Who is responsible for what, when carrying out this activity and how are the roles organised?		
<i>Community</i> in which activity is conducted	What is the environment in which this activity is carried out?		
Expected outcome	What is the desired Outcome from carrying out this activity?		

The questions posed by Mwanza (2001) especially the how's as follows will be used to assist in identifying contradictions within the activity system.

- What *Tools* does the *Subjects* use to achieve their *Objective* and how?
- What *Rules* affect the way the *Subjects* achieve the *Objective* and how?
- How does the *Division of Labour* influence the way the *Subjects* satisfy their *Objective*?
- How do the *Tools* in use affect the way the *Community* achieves the *Objective*?
- What *Rules* affect the way the *Community* satisfies their *Objective* and how?
- How does the *Division of Labour* affect the way the *Community* achieves the *Objective*?

Examples based on themes of subjects (students) are listed in Fig. 2. The figure illustrates how the data was reduced to generate the key themes for each of the six components of Activity Theory.



Figure 2: Coding Process and Examples (Bottom-Up Approach Based on Grounded Theory)

#### **Results and Discussion**

### Perceptions of IaH

The interpretation of nodes found in this study helps to answer RQ1: "what are the perceptions of IaH". The developed model is (Figure 2) (The lines (both black and blue) represent potential secondary contradictions).

Participants across both datasets identified four key expected outcomes/purposes of this initiative: curriculum transformation, student development, academic development, and improvements in income generation and university reputation.

"In traditional class, the teacher may focus more on the teaching of theory and writing on the blackboard to answer questions about the coursework, but in the class of a teacher with overseas experiences, he may guide us to learn, and then teach us to solve problems by ourselves, including information retrieval and software learning." (GX2)

"The university expects us to broaden our global vision by involving international activities." (PR3)

"The teachers with overseas background will be more open-minded and casual. They will expand the knowledge and guide us to think." (PR11)

"There is no doubt that the Sino-foreign cooperative education exists for the profit." (PR2)

GX8 hold the opinion that it would help raise the university's voice in the world, while GX15 thought the international collaboration experiences would enhance their management skills and improve the ranking. GX9 mentioned that introduction of international students could be

one indicator to improve the international reputation, because the scale of international students was counted in university rankings.

Additionally, participants from the GXPU dataset emphasise the importance of education equity, attributing this priority to the distinctive background of their city. This group placed significant emphasis on local characteristics and needs when implementing IaH strategies, indicating a tailored approach to internationalisation efforts that aligns with the specific context of their environment.

"For individual students, because the ways to gain knowledge and understand the world are more diverse, it will narrow the gap of information and resources between us and students from top universities or big cities." (GX13)



Figure 3: The Development Model Based on the Interpretations of Findings Into Nodes

The data shows that, in this context, internationalisation is interpreted to mean incorporating western models of higher education through adopting its criteria and practice (Wang et al., 2020) such as Sino-foreign education. This also aligns with the findings of Liu (2021). However, the data also shows the Chinese universities have awareness of the balance between local needs and westernisation. For example, the emphasis on adapting the strategy to "the actual conditions of the city" which recognises that Chinese cities vary greatly in terms of economic capabilities, educational infrastructure, cultural contexts, and existing international links. These findings extend the knowledge to the previous perceptions that

some developing countries may easily simply mimic the priorities of Anglo-Western forms of internationalisation (de Wit et al., 2019).

The findings show that implementation of an internationalisation strategy improves students' English proficiency, but they are still struggling for the language competency. This is not an issue in a westernized, largely Anglo-Saxon, and predominantly English-speaking paradigm (Galloway, Numajiri & Rees, 2020). However, this greatly impacts the internationalisation progress in a non-native English-speaking country, where English proficiency is a challenge teachers and students. Furthermore, the data shows that teachers and students would have more opportunities to interact with the teachers and students from western practices aligned with Liu (2021).

Nevertheless, the findings show an increasing awareness of internationalisation, benefiting faculties and students without mobility, through the introduction of good curriculums model from abroad to help the transformation of the local curriculum. This provides a model of a trend of internationalisation in China of a gradual transiting from elite to common practice, from mobility to IaH (de Wit & Altbach, 2021). As identified in this study, IaH has potential democratise the benefits of internationalisation to a wider segment of society (Harrison, 2015), including those who cannot afford to study abroad (Beelen and Jones, 2015). It allows students to stay on campus, broaden their knowledge of the world, and develop the awareness and skills needed to become global citizens. Establishing internationalised campuses is a key method for achieving 'local internationalisation' (Liu et al., 2020).

## Contradictions and Changes That Occur As IaH Is Implemented

Another significant finding of research is its exploration of the contradictions to answer second research questions, which is related to *the tools* (international academic models) and the *rules* (traditional education methods), especially how *Tools*, *Rules and norms* and *Division of labour* as mediator influences the way that the actors (*Subject, Community*) achieve the *objective*. Based on the findings, every component in the AT model in this study is interconnected and mediates the learning process consistent with Engeström (1987).

This study reveals several contradictions. These include the struggle between maintaining large, traditional, teacher-centred classrooms and adopting student-centred learning environments that foster individual attention.

"It is about fifty to sixty students in one class I attended before. But in the university (Sino-foreign School), there is small size class, so I feel like being noticed by teachers." (PR6)

"I felt that the biggest problem was adaptability. That is, if you want to implement IaH, you need to change the traditional teaching method which had been taught from primary school." (GX12)

"They've been taught to be respectful to others, especially when the elders or someone else is talking, you have to be quiet, you cannot disturb them." (PR4)

And the reliance on memorisation-based assessment methods which do not align with the demand for practical, industry-relevant skills; and the outdated curriculum, which fails to keep pace with advancements in technology like AI and robotics.

"Technology of software such as Java update very quick, and the learning modules cannot catch up with the updated speed. On the contrary, the outdated ones still be taught. The students may just simply go through the books and memorise them a month before the final exam, they may pass the exam. But it did not mean that they have mastered core aspects of the technology because they might not get a chance to operate it." (PR14)

Furthermore, while internationalisation brings foreign academic models and curricula, the process is restricted by limited faculty training, language barriers, and uneven access to international resources, all of which contribute to superficial or inconsistent implementation of IaH across different regions.

"The international projects require us to use the English as media instruction (EMI), this is a big challenge for us from this level of university." (GX6)

Both GX12 and PR9 express concerns over the scarcity of academics with international experience and the frequent changes among introducing academics. although not explicitly mentioned by the participants, the effectiveness of online learning and international collaboration is contingent on the availability of reliable internet access and digital tools. The digital divide can exacerbate educational inequalities, particularly affecting students from regions with limited technological infrastructure.

These issues are exacerbated by the shortage of qualified teachers, logistical challenges, less government support, and the digital divide, which makes international education less effective in some areas. The detail contradictions listed as *Tools* related, *Rules and norms* related, and *Division of Labour* related as table 2, table 3 and table 4 as follows.

	Table 2: Contradictions Related to Tools			
Traditional practices	Changes and developments	Sub-Activity triangle focused		
		on		
Large class and less	Small class and individual	Subject-Tool-Object		
individualised approach	focus	Division of labour-Tool-Object		
Assessment over-focus	The assessments focus on	Community-Tool-Object		
on written test (exam)	practical skills	Subject-Tool-Object		
and memorisation				
Outdated teaching content	Novel and internationalised curriculum	Community-Tool-Object		
Local academics only	Foreign academics and	Division of labour-Tool-Object		
	locally trained academics with overseas experience	Subject-Tool-Object		
Unaffordable	Democratising access	Subject-Tool-Object		
Low competency of	Higher exposure and	Subject-Tool-Object		
English and cross-	competency of English and			
cultural skills	cross-cultural skills			

Traditional practicos	Changes and developments	Sub Activity triangle focused
r raditional practices	Changes and developments	Sub-Activity triangle locused
		on
No understanding religious belief	More understanding of religious belief to prevent conflicts	Subject- Rules &norms -Object
More collectivism	More individualism	Division of labour- Rules &norms -Object
Teacher-centred approach/Confucian learning belief	Student-centred approach/Critical thinking	Subject- Rules &norms -Object

Table 3: Contradictions Related to Rules	& Norms
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Table 4: Contradictions Related to Division of Labour					
Traditional practices	Changes and developments	Sub-Activity triangle focused			
		on			
Disconnect with current industrial needs	Introduction of up-to-date and relevant skills	Community-Division of labour- Object			
Lack of resources and support	More accessible resources and support	Community- Division of labour - Object			
Low awareness of IaH among academics and institution	More understanding of IaH	Subject-Division of labour- Object			
Teachers take on parenting role	Students tend to be more autonomy	Subject-Division of labour- Object			

Following Mwanza (2001), the "object" is the focus of activity, two actor nodes (*Subject* and *Community*) are mediated by *Tools*, *Rules and norms* and *Division of labour*. However, the *Division of labour* could also be mediated by *Tools* and *Rules and norms* in this study, because in the IaH activity system, the roles and responsibilities represented by human beings rather than a computer system in computerised area. The findings identified that the relationship between *Division of labour* and *Object* is mediated by *Tools* and *Rules and norms*.

## Conclusion

## Significance

This study provides a theory-based qualitative investigation of the experiences of STEM students of IaH in Chinese universities. By focusing on a non-Western context, it contributes to a more complete understanding of internationalisation and offering new insights that can benefit students, employers, and nations, especially since IaH has traditionally concentrated on Western countries.

This is the first example in the available literature of an application of AT in the field of IoHE. AT has served as a valuable framework for analysing the systemic contradictions that arise when IaH is implemented in a traditional educational setting. It has helped elucidate how different components of the educational system interact and conflict, and how these contradictions can act as driver to foster educational transformation. One significant insight

arises from the exploration of the contradictions related to the *tools*, *rules and norms* and *division of labour*, especially how *tools* and *rules and norms* and *division of labour* as mediator influences the way that the actors (*subject, community*) achieve their objective. AT has helped frame these contradictions, showing how the introduction of new tools and methods disrupts established systems, causing tensions that need to be addressed for successful integration. One example is the students as *subject* mediated by introduction of academic model with small class and individual focus as *tools*, which cause the contradictions with traditional practices like large class and less individualised approach.

Unique to this study lies an application of Mwanza (2001)'s activity system framework within the IaH context, specifically regarding human-centred roles rather than automated systems typical in computer design. By identifying that the *division of labour* is mediated by *tools* and *rules and norms* in a way unique to human actors, the study extends the understanding of how activity systems can operate within non-computerised environments. This adjustment provides a nuanced insight into the IaH framework, highlighting the complexity of human roles and responsibilities within institutional structures and suggesting that the *division of labour* can influence the *object* through varied mediations, not solely reliant on automated or procedural methods. This demonstrates that the *division of labour*, *tools*, and *rules & norms* can interconnect dynamically with *object* in the IaH context, extending the AT framework's application understanding to education and social environments.

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## Assessing Economics Preservice Teachers' Lesson Planning Through the Lens of Differentiated Instruction

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#### Abstract

Differentiated learning has been identified as an effective pedagogical philosophy that guides lesson preparation so that educators can teach effectively in inclusive classrooms. The purpose of the study is to find out if preservice teachers can prepare lessons that cater for diverse learners. A qualitative research approach was utilized to investigate preserve teachers' knowledge of differentiated instruction in the context of economics teaching and learning. The researcher collected data through content analysis and focus group face-to-face interviews. A total of 18 preservice teachers' lesson plans were analyzed to determine whether lesson objectives and lesson activities were differentiated. The results indicate that most of the preservice teachers are not able to plan lessons for differentiated classrooms. The recommendation is that teacher education should equip pre-service teachers entering the workforce with effective differentiation instruction and inclusive pedagogy to meet the needs of diverse learner populations. Educators should have the necessary abilities, knowledge, and dispositions to meet the needs of all learners in mainstream classrooms.

Keywords: Economics, Preservice Teachers, Lesson Planning, Differentiated Instruction

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#### **Background and Introduction**

Research has found that differentiated instruction caters for learner diversity and that "onesize-fits-all instruction" does not work effectively due to learner differences in preferences and background knowledge, even if they are of the same age (Pham, 2012; Tomlinson, 2017). This is supported by D'Intino and Wang (2021), who argue that differentiated learning is an effective way of addressing the various learning, cultural, ethnic, and socio-economic differences within mainstream classrooms. Due to its numerous benefits, differentiated instruction has become the central focus of teachers' education across the globe, South Africa included. Today's learning environment is more diverse, more inclusive, and more capped into technology than ever before (Tomlinson, 2014). The need for equity through the adoption of inclusive education has led to the development of a slogan centered on "education for all/no child should be left behind". This call or slogan can only be fulfilled if the teaching strategies used in the learning environment embrace all learners regardless of their socio-economic background or ethnicity.

The purpose of this research article is to determine whether preservice teachers can prepare lessons that cater for diverse learners. This initiative is critical, bearing in mind the need for inclusiveness since the learning environment is affected by globalization and immigration. As a result, teachers entering the workforce are supposed to be equipped with effective differentiation instruction and inclusive pedagogy to meet the needs of diverse learner populations (Baxter, 2013; Black & William, 1998). Teacher education must prepare student teachers with teaching skills which will enable them to teach effectively in diverse classrooms. There is neurodiversity in schools, which requires newly qualified teachers to be aware of and be able to handle such environments (Cook, 2024). Pre-service teachers should be highly prepared to pay attention to learners who display, for instance, hyperactive or autism spectrum disorder or other learning disabilities (D'Intino & Wang, 2021). A similar technique was used by D'Intino and Wang (2021), who reviewed and evaluated the professional preparation that Canadian elementary school teachers are offered in their university programs regarding inclusive education and differentiated instruction.

In this research "differentiated instruction is defined as a pedagogical philosophy for modernday teachers that guides lesson planning so that instruction can better account for the various characteristics and learning needs of all the students in the classroom" (Bukhari, 2019; Tomlison, 2014, p 669). Differentiated instruction can further be described as a methodical and elastic approach which can be interpreted into various forms of instructional practices such as flexible and ability grouping activities, tiered lessons, anchored instruction, flipped learning, and authentic assessment (Kaur et al., 2019; Ramli & Nurahimah, 2020).

Several countries have accentuated the prominence of inclusive learning classrooms for learners and juveniles (Bondie & Zusho, 2018; Hardy & Woodcock, 2015). The study is significant because it has implications for curriculum designers, policymakers, universities, school administrators, parents and teachers.

For effective teaching, educators need to be completely aware of learners' intellectual development and readiness levels for the use of proper instructional methods and strategies (Pham, 2012). Differentiated instruction should guide educators when planning the content to teach. This will lead to the formulation of differentiated questions, knowledge, and practical skills that certainly benefit learners to cope with the given content. The learning styles theory recommends that diverse students have different methods of learning, and instructional

methodologies ought to respond to varied learning styles to maximize academic performance (Dunn, 2000).

Differentiated instruction is recognized as an accumulation of many theories and practices linked to effective teaching and its relation to student success. Students vary according to readiness, capability, motivation, background and interest (Variacion et al., 2021). Therefore, differentiated learning requires planning for numerous modalities of instruction and evaluation to accommodate learner differentiation (Gafforov & Abdulkhay, 2022). Consequently, differentiated instruction gives all students an opportunity to improve their academic performance (Richards & Omdal, 2007). Furthermore, differentiated instruction has also been linked to improved reading scores for elementary school students (Reis et al., 2011) and middle school students (Little et al., 2014). In addition, differentiated instruction was found to improve literacy scores and to be effective in reducing achievement gaps between learners from high and low socioeconomic backgrounds (Valiandes, 2015) and improve outcomes in mathematics for elementary school students (Prast et al., 2018).

Like any other strategy, differentiated instruction has its own limitations. Some challenges that significantly limit the use of differentiated instruction approaches include high learner-teacher ratios in the learning environment, lack of availability of learning equipment and instruments, classroom layouts not being suitable for differentiated instruction, and the amount of planning time and effort that is required for effective differentiation according to interest, readiness, and ability (Aldossari, 2018). However, even if there are challenges, differentiated instruction is nonetheless the most widely considered approach due to limited options for teaching diverse learners in the classroom (Bajrami, 2013). Therefore, it is important for teachers to be given rich learning opportunities to master the techniques of using differentiated instruction since it is an important pedagogical skill. Preservice teachers should be fully prepared for the challenges of the classroom. Research should assist in bringing insights to provide conceptual and pedagogical tools to advance understanding of the barriers to inclusive practice in schools and increase teachers' capacity to embrace a more inclusive pedagogical approach (Cook, 2024).

Teachers should be able to prepare lessons that accommodate student differences and scaffold their progress (Salleh et al., 2022). More importantly, teachers should be conscious of creating inclusive learning by adopting the notion of differentiated instruction (DI) (Salleh et al., 2022). Therefore, the need to understand various learners' needs in class should be emphasized in lesson preparation. The differentiation of lesson objectives and class activities is one of the best ways of diagnosing learners' needs while the lesson is in process because the pedagogical purpose of assessment is to monitor and inform both teaching and learning to stimulate change when needed (Remesal, 2011). Activities are important because they can improve academic performance, and they need to be differentiated to suit the learner's needs. Class activities should be differentiated because they enable learners to understand the content since they are aligned with learning objectives or learning goals. Diverse learners are expected to interact and work together as they develop knowledge of new content.

With appropriate planning, teachers can differentiate activities to meet the needs of a variety of learners effectively. Student teachers need to know how to use differentiated assessments in today's inclusive classrooms. Three elements of the curriculum that can be differentiated are content, process, and products, as identified by Tomlinson (2017). This research focuses on activities which are given when the lesson is in progress as part of formative assessment. The researchers looked at 18 lesson plans to determine if activities were differentiated. This

was done to see how trainee teachers differentiate class activities. The variation seen in a differentiated classroom is most frequently reflected in the way students gain access to important learning. Furthermore, meaningful pre-assessment naturally leads to functional and successful differentiation. Teacher education should prepare preservice teachers for the complexities of today's classrooms (Goodnough, 2010).

Although there have been a growing number of studies investigating the use of differentiated instruction in subjects such as chemistry, physics and mathematics, there is a scarcity of research focusing on the challenges of practicing differentiated lesson planning in economics classrooms, especially how overcrowded these classrooms may be. Past studies in differentiated classrooms revealed that teachers faced various challenges, such as scarcity of resources, lack of time, larger class sizes, and a lack of support, knowledge and training that prevented them from practicing (Aldossari, 2018; Lavania & Nor 2020; Salleh et al., 2022; Shareefa et al., 2019). The following section presents research methods adopted for this study.

## Methodology

This study used a qualitative content analysis approach research method where 18 lesson plans were analyzed. Several social science researchers have used variations of qualitative content analysis partly because it is a multifaceted or flexible methodology for analyzing content across many social science research frameworks (Serafini, 2015; Serafini & Reid, 2023). The utilization of content analysis is most often associated with an interpretivist paradigm and has been seen as the answer to the narrow parameters associated with traditional, quantitative approaches to content analysis (Elo & Kyngas, 2008, as cited in Serafini & Reid, 2023). Researchers have used content analysis as a form of analysis for investigating textual or linguistically based data in qualitative social science research studies (Kohlbacher, 2005). Additionally, earlier researchers like Abrahamson (1983, as cited in Serafini & Reid, 2023) argue that qualitative content analysis can be successfully used to study any kind of communication materials effectively, including narrative responses, openended survey questions, interviews, printed media such as articles, and books or manuals.

Lesson plans were analyzed to determine whether activities were differentiated. Content analysis was further validated and complemented with focus group interviews. A total of 24 final-year economics pre-service teachers were interviewed in groups of eighty. Interview questions were structured for uniformity and an in-depth understanding of the phenomenon. Interview questions allowed both the researchers and participants to explore perceptions of differentiated instruction. The responses of the participants were audio recorded and were later transcribed verbatim and were manually written.

#### Data Analysis

Two different sets of data were analyzed, namely lesson plan analysis, referred to in this study as content analysis, and interview data, which was collected through focus group interviews.

#### **Content Analysis**

Teachers are supposed to deliver quality lessons using differentiated assessment practices that positively enhance the cognitive understanding of diverse learners (Porta et al., 2022;

Westbroek et al., 2020). Different activities embrace different learners with different learning styles, and this immediately impacts student learning. Table 1 presents the number of lesson plans analyzed for this study. The researcher investigated if final-year pre-service teachers used a variety of activities to cater for the varied skills and tastes of the learners. The 18 lesson plans analyzed were collected from 102 students who planned lesson plans in groups. These groups had a membership which varied from four to seven members. Student teachers prepared lesson plans from selected Grade 12 economics topics to prepare a one-hour lesson with four different activities. The selected topics would enable different activities such as explanations, role plays, educative game videos, poster presentations, data projection and graphical presentations. These are some of the multiple modes of activities the researcher hoped the final-year pre-service teachers would include in their lesson plans. These activities are the most appropriate ones for the selected Grade 12 topics. Similar activities were also so suggested by Koshy (2013) in a study titled "Differentiated assessment activities: customizing to support learning."

Table 1: Analyzed Lesson Plans								
Group	Number	Number		Types of Activities				
	of	of	Explanation	Roleplay	Games	Posters	Data	Graphs
	students	activities	activities		videos		projection	-
1	7	4	4	0	0	0	0	0
2	6	4	3	0	0	0	0	1
3	7	4	4	0	0	0	0	0
4	7	4	3	0	0	0	0	1
5	7	4	4	0	0	0	0	0
6	4	4	4	0	0	0	0	0
7	5	4	3	0	0	0	0	1
8	4	4	3	0	0	0	0	1
9	6	4	4	0	0	0	0	0
10	5	4	4	0	0	0	0	0
11	7	4	4	0	0	0	0	0
12	4	4	4	0	0	0	0	0
13	5	4	4	0	0	0	0	0
14	7	4	4	0	0	0	0	0
15	5	4	4	0	0	0	0	0
16	5	4	4	0	0	0	0	0
17	6	4	4	0	0	0	0	0
18	5	4	4	0	0	0	0	0
Total	102	72	68	0	0	0	0	4
%			94.4 %	0%	0%	0%	0%	5.6%

The lesson plans were examined in terms of differentiated activities used while the lessons were in progress. The data analyzed from the lesson plans revealed that student teachers were not able to differentiate activities to cater for diverse learners. The activities which required explanations and definitions of terms were 68 out of 72, or 94.4% of the activities. Only four activities (about 5. 6%) required graphical presentations. Most of the activities analyzed were explanation activities which catered for those who were verbally oriented. This is of great concern because the newly qualified teachers seem not to have grasped the need to accommodate diverse learners in the classrooms (Hudson, 2013). There is a serious need to vary methodology, activities and assessment tools for effective management of knowledge acquisition for the teeming population admitted into the learning environment in our modern society.

Teacher education should be intentional in preparing student teachers for inclusive classrooms. The use of posters is not just pictorial but provides visual presentations of simple, brief and well-articulated summaries of written works to stimulate an audience (Aduradola & Akeredolu-Ale, 2013). This type of activity can stimulate learners who understand pictures and visual presentations better. Learning environments require active learner participation and attendance to ensure effective knowledge dissemination (Haelermans, 2022; König et al., 2020; Kyttälä et al., 2022). Educators should try to vary activities to embrace learners with different learning styles and understanding levels and not just use one type of activity repeatedly; this becomes monotonous, and learners might lose interest in the subject and learning in general (Hardy & Woodcock, 2015; Serafini, 2015).

### **Interview Data**

The following three questions were asked:

- 1. What is differentiation instruction?
- 2. Explain how you prepare lessons that cater for diverse learners.
- 3. Explain why it is important for teachers to differentiate lesson activities.

#### **Interview Data Analysis**

Four focus group interviews were conducted in a comfortable and relaxing manner. The students knew each other well, and they happened to assist in selecting who to interview, so they were quite comfortable with each other. Structured interviews were conducted to investigate pre-service teachers' understanding of differentiated instruction. The interviews were audio recorded and later transcribed for analysis purposes. The information gathered from the interviews was analyzed thematically. Three key themes emerged from the data collection: the definition of differentiated instruction, differentiated lesson preparation and the importance of differentiated lesson activities. Interview data was analyzed according to these three themes.

#### Findings

The findings are presented in three categories according to the themes formulated by the researcher.

Theme 1: The definitions of differentiated instruction

All the participants were asked about the meaning of differentiated instruction. One of the participants responded by saying: "Differentiated instruction is when teachers change their lesson to help other students to learn in a way that works best for them, using a variety of teaching methods."

The response given by this participant shows that differentiated instruction is not fully understood. Several participants gave responses similar to the one above. Most pre-service teachers think that differentiated instruction is all about treating learners with learning disabilities differently. This participant views differentiated instruction as a way of segregating learners using different teaching methods. Learners should not be segregated in the mainstream classrooms but should be taught inclusively.
A participant responded as follows: "It is the ability to teach in a manner that accommodate[s] learners with different abilities and learning styles." Several participants provided similar responses.

Such revelations indicate that some pre-service teachers are aware of the demands of differentiated instruction. It is indeed soothing that some teachers can teach inclusively in mainstream classrooms.

Theme 2: Differentiated lesson preparation

One of the participants responded as follows: "I use enhancing media that will improve participation and concentration of learners. I use practical examples and [can] be loud when presenting a lesson."

According to this participant, teaching inclusively is when the teacher uses media and is audible in class. There is a danger here of only catering for one type of learner and ignoring the rest. There are disparities when it comes to planning inclusive lesson plans. Pre-service teachers are not clear on how to prepare for diverse learners.

Theme 3: The importance of differentiating lesson activities

This is how one of the participants responded: "So that the teacher will see whether the lesson activities did cover the lesson objectives as it is the goal of a teacher to achieve lesson activities can be used to achieve lesson objectives."

This participant's response gives an indication that the participants do not know the importance of differentiated lesson activities and that they are critical in an inclusive learning environment.

#### **Discussion and Results**

Data analysis highlights the need for empowering student teachers with the knowledge and skills of how to prepare lessons for differentiated learning and how to teach in diverse classrooms. In support, Coady, Harper and De Jong (2016) alluded that mainstream teachers throughout the world are increasingly expected to differentiate instruction for learners with diverse learning needs. Universities as learning and knowledge organizations, especially regarding teacher education, should produce teachers who are able to apply differentiated instruction effectively in inclusive classrooms. Differentiated instruction should include strategies like making alterations of the instructional content, process, and product; and enhancing collaboration and autonomy in the learning environment (Pham 2012). Furthermore, teacher education should encourage and accept the productive, innovative practices initiated by pedagogy to produce teachers who can best assess students' needs (Koshy, 2013). More importantly, there should be a conceptual framework that leads to a disconnect between coursework and field experiences in the initial teacher education curriculum (Walton & Rusznyak, 2020). Walton and Rusznyak (2020) further explain that the development of a conceptual framework for teacher education can show benefits, particularly in terms of the development of positive attitudes and self-efficacy for pre-service teachers.

Preservice teachers do not have the ability to differentiate class activities, which is a concern because one-size-fits-all methods of teaching are failing most of the learners. The learning environment is becoming more culturally, socially, and academically diverse (Pham, 2012). This is a clear indication that the knowledge of differentiated instruction is no longer an option, it is a necessary skill which should be possessed by all teachers. Teachers need to be fully aware of their learners' cognitive development and readiness levels for the use of appropriate instructional techniques and strategies since learners perceive, organize, and retain information differently. It is of great importance for teachers to use modern, diverse, and flexible strategies to vary lesson activities to increase learner engagement and understanding (Fousteri & Foti, 2024). Student teachers are uninformed regarding the importance of differentiated activities because the explanation given by most of the participants and lesson analysis indicate that they do not utilize differentiated activities. Research has indicated that one of the most cited barriers to inclusive education is insufficient teacher education that empowers teachers to be able to respond to learner diversity (Walton & Rusznyak, 2020). More importantly, teacher education should implement an activity theory in the framework of differentiated teaching and assessment (Little et al., 2014; Mitsi & Papaspyrou, 2017; Moosa & Shareefa, 2019; Porta et al., 2022).

# Conclusion

The aim of the study was to investigate if economics preservice teachers can differentiate class activities to enhance understanding and cater for learners with diverse learning abilities. Clearly, economics preservice teachers do not have a full understanding of differentiated instruction when it comes to differentiated activities. The lesson plans reviewed showed that student teachers are only capable of giving class activities in one specific way. This makes their activities monotonous and exclusive. The recommendation is that teacher education should respond to the demand that student teachers or newly qualified teachers be given all the necessary skills and tools to teach inclusively. Achieving an inclusive education system in education is not something which should be taken for granted but it is one that is pivotal to creating equitable learning opportunities for all learners in the mainstream classrooms. Initial teacher education is vital in the quest to realise uncontested differentiated teaching. To achieve this initiative, teacher education should develop a differentiated instruction conceptual framework that links content courses with teaching practice courses.

The study, however, was only limited to economics preservice teachers, which made it difficult to generalize.

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#### Smartphones in Learning Arabic by School Students: A Comprehensive Structured Review

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#### Abstract

This comprehensive, structured review examines the impact of smartphones on learning Arabic among school students. The increasing prevalence of smartphones in educational settings offers novel opportunities for enhancing language acquisition, yet their effectiveness in learning Arabic, a language with unique instructional challenges, remains underexplored. This study aims to acknowledge this gap by systematically reviewing existing literature to understand the role of smartphones in Arabic language education. The study's flow relies on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. Advanced search techniques were employed on Scopus and Eric databases using the keywords "smartphones," "learn," "Arabic," and "school," yielding (n=27) relevant articles. These articles were categorized into three primary themes: (1) Technology-Enhanced Learning (TEL) and Its Impact on Education, (2) Language Learning and Teaching Strategies, and (3) Special Educational Needs and Inclusive Education. The expected results suggest that TEL, facilitated by smartphones, significantly enhances student engagement, motivation, and personalized learning experiences, thereby improving Arabic language proficiency. Additionally, Mobile-Assisted Language Learning (MALL) applications are anticipated to be effective tools in Arabic language instruction, providing interactive and accessible learning platforms. Furthermore, the review is expected to highlight the critical role of smartphones in supporting inclusive education, particularly for students with special educational needs, by enabling broader participation in language learning activities. The study concludes that integrating smartphones into Arabic language education can significantly enhance learning outcomes and promote educational equity and access.

Keywords: Smartphones, Learn, Arabic, School

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#### Introduction

In an era characterized by rapid technological advancements, the integration of smartphones into educational settings has shown potential in improving language learning experiences (Zou & Thomas, 2018). Many languages are taught across the globe. However, Arabic is one language that is significant due to its history, relevance as well as importance in social and cultural aspects. Yet, the rules and conditions are very hard for learners of Arabic, especially children in school, because learning Arabic requires mastering a complex script, complicated grammar, as well as a variety of dialects (A. Alkohlani, 2023; Al-Assaf, 2021; Albagami, 2023). Against this background, this study investigates the facilitative role smartphones have in the acquisition of Arabic amongst students at school, aiming to contribute towards their language proficiency as well as intercultural competence. One significant and impactful advancement has been smartphone usage, which has taken root among students, signalling transformed learning through improper means. Mobile devices, including smartphones, provide a more dynamic learning experience compared to traditional classroom approaches that depend heavily on textbooks and lectures, as they allow learners to connect with Arabic skills on-the-go (Adnan et al., 2020; Juma et al., 2018). Whether through language learning applications, multimedia content, or online communities, smartphones provide students with access to diverse learning materials tailored to their individual needs and preferences.

The ability of smartphones to aid Arabic language learning is an act of independent learner as well as motivating the learner. Smartphones had control of the learning process over to the learner, allowing them to set their own learning objectives, monitor their own progress as well as pursue subjects of interest at their own speed. Such autonomy not only cultivates ownership and responsibility but also enhances intrinsic motivation, leading to more effective and holistic learning outcomes. Moreover, these smartphones also enable immersive as well as interactive learning experiences, which are useful for a complex language like Arabic (Elgamal et al., 2018). By having access to a wide array of features from voice recognition to multimedia content and gamified exercises, students can dynamically and engagingly interact with Arabic language materials, leading to improved comprehension, fluency as well as pronunciation. Furthermore, smartphones promote genuine communication and cultural exchange by connecting students with native speakers and other learners around the globe, allowing them to practice their language skills in real-world settings as well as foster intercultural awareness. The incorporation of smartphones within the Arabic language follows the direction of a wider pedagogical trend, which favours the inclusion of skills linked to digital literacy as well as capabilities needed in the 21st century. Whether this entails remotely collaborating with different classrooms or utilizing the myriads of online resources available today, educators can leverage technology in support of teaching languages while also promoting the invaluable critical thinking, communication, and collaboration skills associated with living in an improvingly connected as well as multicultural world (Mathis et al., 2016; Moyo, 2019). In addition, smartphones present valuable opportunities for differentiated instruction, enabling teachers to meet the diverse needs as well as learning styles of students through customized learning pathways and specific feedback.

Finally, smartphones can be considered an effective means of improving Arabic language learning among students in schools as they offer a flexible, interactive, as well as engaging platform that can be integrated with traditional forms of instruction. Utilizing the possibilities that smartphones offer, educators can facilitate the creation of autonomous learners with the linguistic as well as intercultural skills needed to function in an interconnected world. This article will delve deeper into the various ways in which smartphones can be effectively integrated into Arabic language teaching and learning, drawing on research evidence and practical insights to inform educational practice and policy.

## Literature Review

The study by Rohmah, Nur Sholihah, Basthomi, and Milal (2024) investigated the linguistic landscape at the Darussalam Islamic Educational Complex in Gontor, Indonesia. This research highlighted the prominence of English and Arabic languages in public signs as well, which was in line with the institution's given language policy to equip the students for their international encounters. The dominance of these languages, compared to that of Bahasa Indonesia and Javanese, emphasizes the pragmatic mindset towards education, valuing global readiness over the representation of local or national languages. The results underscored how such policies advance critical issues for education policies and policy from government more broadly as well as encouraged a dual focus on linguistic diversity as well as educational colonialism in the educational field. Meanwhile, the multilingual challenges in the classroom are further explored by Hagenaars, van Heese, Vantieghem, and Stevens (2024) in Flemish schools, where teachers predominantly adopt a monolingual approach to facilitate Dutch language proficiency among students. Nevertheless, there is infrequent flexibility in order to embrace multilingualism when the person speaking the language is different from the original speaker, different context, or the purpose differs. The use of both approaches also drew attention to the fluidity of language policy in multicultural educational contexts, as well as the importance of headteacher in moulding these practices.

Within the framework of online learning amidst the COVID-19 pandemic, Bajamal, Anazi, Esheaba, and Hantira (2023) validated the Arabic version of the Positive/Negative Experiences of Parents for School-aged Students Assessment Scale. The psychometric assessment in this research revealed the exploratory factor analysis as well as internal consistency to support the scale's validity and reliability. These tools are vital for understanding as well as mitigating the effects of online education on parents and children across Arabic-speaking populations. Similarly, Rashid and Chehadeh (2023) focused on adapting chemistry experiments for visually impaired or blind students using assistive technologies like Sci-Voice Talking LabOuest. For instance, the research highlighted the importance of inclusive education by illustrating that through the employment of tactile tools and adaptive methods, BVI (Blind and Visually Impaired) students can engage in practical scientific work, thus enriching their learning experiences as well as access to education. Dreisbach and Mendoza-Dreisbach (2023) discussed the language policies outlined in the Bangsamoro Education Code, which integrates Arabic, English, and Filipino into the curriculum of the Bangsamoro Autonomous Region in Muslim Mindanao. Despite such provisions, the research acknowledged pertinent issues, which include the difficulties that students encountered with Arabic and English, along with the marginalization of non-Muslim Indigenous peoples. The study recommended policy improvements to increase educational practice language diversity as well as inclusion.

Rodríguez (2023) explored the understanding of numerical place value among first-grade students in Cali, Colombia, focusing on additive composition and numerical equivalence as key predictors. Using a quasi-experimental design, the research illustrated the function of these mathematical concepts for writing Arabic numerals correctly, and this interpreted about what instructional strategies are effective for early mathematics education. Alaoui and Elaachak (2023) described the development of a serious game in Arabic using the GLUPS

methodology to transform a traditional card-based game into a digital format. This illustrated the potentiality of serious games for enhancing learning as well as knowledge acquisition, especially in developing countries in which digital tools can greatly increase educational outcomes.

Gür and Öz (2023) investigated the perceptions of Arabic language learning among preparatory class students at Kilis 7 Aralık University using metaphors. Findings reflected varied perspectives of Arabic among students, ranging from hard to a better impression of the language. Such metaphorical realizations offered richer insights into students' personal experiences as well as the dynamics which mold their language learning. At the same time, Almjally, Howland, Good, and du Boulay (2023) analyzed the gestures of primary school children in Saudi Arabia as they explained programming concepts. Children's gestures reflected their conceptual understanding and were shaped by their right-to-left language directionality. This line of research advanced our understanding of embodied learning as well as the impact of gestures on teaching programming concepts to early learners. Ginzburg and Barak (2023) assessed the influence of Technology-Enhanced Learning (TEL) on students' motivation to learn science from a cross-cultural insight. The research highlights the importance of exploring new technological tools that can enhance engagement as well as motivation through culturally responsive practice in science education.

One major challenge is engagement and motivation that need to be fostered in science learning as a focus among elementary school students. The use of technology as digital sensors and data recorders, since they have been used, can clearly raise student engagement. A study by Makmur and colleagues (2024) focused on evaluating the motivation in learning science among elementary students from broad cultural backgrounds, revealing that the use of technology can bridge cultural gaps and increase motivation. The study found 2 approaches to TEL (divergent and convergent), both connected to increased student interest, relevance, enjoyment, as well as interaction across cultures. These results highlight the importance of harmoniously embedding technology into the educational context of science, improving cross-cultural experiences as well as processes of scientific endeavors. During the COVID-19 pandemic, many institutions have quickly adopted online systems for learning and teaching, this also impacted the world of foreign language education, especially in Islamic boarding schools.

On the other hand, Mhd Alkasirah et al. (2024) investigated the effects of this shift, applying the Taallum Website as an e-learning model. Studies have shown an increase in teacher engagement as well as teacher effectiveness in teaching Arabic and English post-COVID-19, and the t-test value was significant. Such delivered education aimed at not only retaining but also improving educational quality in challenging scenarios, as significantly distinguished from already existing as well as developing learning modules. In the realm of language education, vocabulary acquisition is pivotal for learners of Arabic as a foreign language. Mhd Alkasirah et al. (2024) developed a tool designed to measure Arabic vocabulary accomplishment through a digital storytelling-based application, which was validated by experts and tested for reliability among Malaysian secondary students. The instrument showed excellent content validity as well as internal consistency with a Cronbach's alpha value equal to. 810. In particular, one study found that introducing digital stories resulted in a significant increase in vocabulary acquisition, providing tantalizing evidence for the potential of using technology in language learning contexts.

Translanguaging, the practice of using different languages throughout one or more subjects in educational settings, is growing in popularity as an approach to pedagogy. Eldjoudi (2024) explored its application in Algerian English as a Foreign Language (EFL) classrooms, where Arabic, Tamazight, French, and English are all used. Translanguaging was found to negotiate elements about social justice, and new English vocabulary was taught to students. It also improves the way students express themselves by expanding their language pools, their ways of expressing things, and their understanding of cultural contexts and diversity. Moreover, these results repeated the usefulness of translanguaging in terms of language learning, but they also revealed its crucial role in dealing with larger social problems in educational settings. At the same time, Elhakeem, Ibrahim, El-Maghraby, and Fouad (2023) addressed the lack of structured programs for enhancing Executive Functions (EF) in Egyptian children with learning disorders. The research used a mixed intervention based on "Executive Functions Training-Elementary" and "Promoting Executive Function In The Classroom" programs. Both EF and dyslexia assessments showed significant improvements after the intervention. This study illustrated the importance of structured programs by showing the improvement of tailored rehabilitation programs over general rehabilitation through the cognition as well as academic outcomes of children with learning disorders.

Gamification is emerging as an innovative approach to language teaching. For example, Ismail, Makhtar, Chulan, and Ismail (2023) developed a framework for implementing gamification in Arabic language education in Malaysia. This method was aimed to motivate learners by creating a gamified environment to enhance their listening, speaking, reading as well as writing skills. The authors cite studies linking gamification to motivation as well as performance. This framework of the model was part of the wider adoption of the principles of gamification into practice that attempted to improve the teaching and learning outcomes of learning a language. Alfakhry et al. (2023) provided an evaluation of the Learning Environment (LE) in Syria's largest medical schools, revealing significant deficiencies. Clinical-stage students reported lower perceptions of LE when measured using the Dundee Ready Educational Environment Measure (DREEM) inventory compared to pre-clinical students. The present study emphasized the urgent need for reforms of education in the field of academic as well as clinical competencies of medical schools in Syria. Indeed, the remedial actions for these shortcomings are imperative in improving the standard of medical education as well as preventing the possible migration of human resources.

Ismaiel, AlGhafari, and Ibrahim (2023) examined a peer-assisted learning approach to promote language concordance between physicians and patients in the United Arab Emirates (UAE). Their pilot program was designed to teach Arabic medical terminology to medical students, leading to significant gains in communication as well as confidence during clinical encounters. Student feedback also highlighted the importance of integrating local language training into medical curricula to improve patient care as well as satisfaction. Meanwhile, Alqaan and Qamar (2023) conducted a sentiment analysis with regard to Arabic tweets related to online learning amidst the COVID-19 pandemic. They used machine learning and Long Short-Term Memory (LSTM) methods to examine nearly 100,000 tweets and found that the sentiment regarding online education was considerably negative. To attain this, the research employed a combination of techniques such as SMOTE (Synthetic Minority Oversampling Technique) to enable dataset balancing for working with a more reliable analysis. Additionally, it revealed how the public viewed online learning as well as highlighted the importance of enhancing online learning programs to prepare for future students and educators.

# Material and Methods

# Identification

Several essential steps in the systematic review process were undertaken to identify a significant amount of pertinent literature for this study. Initially, a few keywords were chosen, and then similar terms were identified utilizing thesauruses, dictionaries, previous research as well as encyclopedias. Once the search strings for the Eric and Scopus databases were established, all relevant terms were included (see Table 1). As a result, 208 publications were successfully gathered from both databases during the initial phase of the systematic review process for this research.

	Table 1: The Search String
Scopus	TITLE-ABS-KEY ((smartphones OR "mobile learning" OR app* OR "online
	platform" OR digital) AND learn* AND Arabic AND school AND students)
	AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2022) OR
	LIMIT-TO (PUBYEAR, 2023) OR LIMIT-TO (PUBYEAR, 2024)) AND
	(LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (PUBSTAGE, "final")) AND
	(LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (LANGUAGE, "English"))
	Date of Access: May 2024
Eric	(smartphones OR "mobile learning" OR app* OR "online platform" OR digital)
	AND learn* AND Arabic AND school AND students)
	Date of Access: May 2024

# Screening

During the screening step, the collected research items are evaluated for alignment with the predefined research question(s). Typically, content-related criteria are used in this phase, such as selecting items based on the topic of smartphones in learning Arabic by school students. At this stage, all duplicate papers are eliminated from the list. Moreover, the initial screening stage excluded 147 publications, leaving 61 papers to be examined in the second stage, relying on a variety of inclusion as well as exclusion criteria (refer to Table 2). Moreover, the primary criterion was literature (research papers), as it provides practical suggestions. This also included reviews, meta-analyses, meta-syntheses, books, chapters, book series as well as conference proceedings not part of the latest study. Additionally, the review was restricted to English-language publications and focused on a four-year timeframe (2021–2024). Ultimately, no publications were rejected due to duplication.

Table 2:	The	Selection	Criterion	in	Searc	ching
					~ ~ ~ ~ ~ ~	

	Tuole 2. The Selection effect	
Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2021 - 2024	< 2021
Literature type	Journal (Article)	Conference, Book, Review
Publication Stage	Final	In Press

#### Eligibility

The final review sample is established after satisfying all inclusion as well as exclusion criteria. It is crucial to provide a detailed list of the research items in this sample so readers can see which items underpin the study's results. At the third level, known as eligibility, 61 articles were initially included. During this stage, all article titles as well as key content were meticulously reviewed to ensure they fulfilled the inclusion criteria and were relevant to the study's research aims. Consequently, 31 publications were eliminated because their titles and abstracts were insignificantly associated with the study's purpose, relying on empirical data. Ultimately, 30 papers were included for evaluation (refer to Figure 1).

#### Data Abstraction and Analysis

An integrated analysis was employed as an assessment strategy in this study to assess as well as synthesize a variety of research designs, specifically quantitative methods. The aim was to identify pertinent topics as well as subtopics. The data collection phase was the initial step in theme establishment. Figure 1 illustrates the meticulous analysis of 30 publications for statements or material pertinent to the present study's themes. Additionally, the authors reviewed substantial contemporary studies on the use of smartphones in learning Arabic by school students, examining the methodologies and research outcomes of these studies. The author then collaborated with co-authors in developing themes relying on the evidence within the study's context. Here, a log was maintained throughout the data analysis process to record any analyses, puzzles, viewpoints, or other thoughts related to interpreting the data. Furthermore, the authors then compared the findings to identify any inconsistencies in the theme development process. Any disagreements between concepts were discussed among the authors. The established themes were subsequently adjusted to assure consistency. Two experts conducted the analysis selection to determine the validity of the issues. The expert review phase ensured the clarity, significance as well as the appropriateness of each subtheme by establishing domain validity.





#### **Results and Findings**

With access to smartphones, which most of the school students learning Arabic use, it has become one of the most necessary tools for any school student who starts learning Arabic these days because of its ease of use, interactivity as well as high access to educational content. It makes language learning apps, online courses, as well as access to multimedia content easy and as convenient as studying Arabic at any place and time. Using these apps, interactive tasks such as games, quizzes, as well as audio-visual methods, make learning specific and to the point, thus, too efficient. In the process, self-paced learning encourages autonomous learning. In addition, smartphones make it easy to interact with peers and native speakers via social media and messaging apps, which can aid in language practice as well as cultural exchange. With personalized learning experiences and cost-effective access to

classrooms, ensuring

diverse educational materials, smartphones significantly enrich students' Arabic language education, promoting both proficiency and enthusiasm for learning. All articles were classified relying on three main themes: TEL and its impact on education (10), language learning and teaching strategies (12), special educational needs, and inclusive education (5) (Table 3).

Authors	Title	Year	Journal	Methodology	Finding and Advantages
Sawaftah and Almobasher	The Impact of Using iPads in Teaching the 3D Shapes Textbook Unit and Promoting Spatial Visualization and Achievement in Mathematics among Eighth- Grade Students	2021	International Journal of Science, Mathematics and Technology Learning	Quasi- experimental study	iPads enhanced students' mathematical achievement and promoted spatial perception.
Alrige, Bitar, Al- Suraihi, Bawazeer and Al-Hazmi	MicroWorld: An Augmented- Reality Arabian App to Learn Atomic Space	2021	Technologies	Design science research paradigm	MicroWorld allows students to visualize chemical elements in 3D and simulate chemical reactions, evaluated through the A-SUS.
Mustafa, Mustafa, Zriqat and Althebyan	MIRNA: Adaptive 3D Game to Assist Children's Distance Learning Difficulties; Design and Teachers' Intention to Use	2023	International Arab Journal of Information Technology	Empirical investigation, qualitative analysis	Teachers have a positive attitude towards MIRNA and intend to use it for online learning.
Aljabri, Chrouf, Alzahrani, Alghamdi, Alfehaid, Alqarawi, Alhuthayfi, and Alduhailan	Sentiment analysis of arabic tweets regarding distance learning in Saudi Arabia during the covid- 19 pandemic	2021	Sensors	Sentiment analysis, machine learning classifiers	The study achieved high accuracy (0.899) in sentiment classification using Logistic regression with specific feature extraction techniques.
Mohamad Alakrash and Abdul Razak	Education and the fourth industrial revolution: Lessons from COVID-19	2022	Computers, Materials and Continua	Purposive Sampling, Qualitative Study	During the lockdown, education experienced a digital transformation as teachers transitioned to technology-based teaching methods. Educators encountered difficulties such as managing virtual

Table 3: The Research Article's Findings Based on the Proposed Search Criterion
- Theme 1: Technology-Enhanced Learning (TEL) and Its Impact on Education

					atable Internat
					stable internet connections, overcoming insufficient preparation and low digital proficiency, and addressing students' mental health concerns.
Shamir-Inbal and Blau	Facilitating Emergency Remote K-12 Teaching in Computing- Enhanced Virtual Learning Environments During COVID- 19 Pandemic - Blessing or Curse?	2021	Journal of Educational Computing Research	Qualitative Research, Nation-wide Online Samples, Grounded Theory Approach	Teachers' experiences revealed 1,822 statements: 580 reflecting challenges (pedagogical, technological, organizational) and 827 reflecting benefits of ERT. The analysis also uncovered 415 pedagogical strategies used in distance learning.
Asbulah, Sahrim, Soad, Rushdi and Deris	Teachers' Attitudes Towards the Use of Augmented Reality Technology in Teaching Arabic in Primary School Malaysia	2022	International Journal of Advanced Computer Science and Applications	Quantitative Methodology, Survey Questionnaire, Data Analysis using SPSS version 26	The research found that teachers' readiness to incorporate augmented reality technology in Arabic instruction is at a moderate level. However, attitudes and knowledge, especially among veteran teachers with little IT experience, were still low, affecting their enthusiasm for technology integration in teaching.
Al-Qatawneh, Alsalhi, Eltahir, Althunibat, Jaradat and Aljarrah	Effects and Perceptions of Mobile Learning in Higher Education	2022	Emerging Science Journal	Quasi- experimental design, Case Study, Achievement test and questionnaire, Data analyzed using SPSS.	The experimental group demonstrated significantly better scholastic achievement and more positive attitudes toward mobile learning compared to the control group.
Ginzburg and Barak	Technology- Enhanced Learning and Its Association with Motivation to Learn Science from a Cross- Cultural Perspective	2023	Journal of Science Education and Technology	Sequential Mixed-Methods Research Design	The study surveyed science teachers and 109 sixth-grade students from Israel as well as the USA, revealing cultural differences in motivation and identifying two phases of technology- enhanced science learning.

(Enabled 24 x 7 hours)

Improves Decision Making

Cost-effectively built

The ability to customize

educational content to suit

the readiness and capabilities of the learner

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Aljarf	Differential Effects of the iPad on First and Second Language Acquisition by Saudi Children	2021	Online Submission	Survey- Questionnaire	The study found iPads are more effective for young children learning languages than older ones, primarily for educational apps on English, Arabic
	during the COVID-19 Pandemic				Alphabet, Quran, numeracy, arithmetic, and animals, but may expose them to inappropriate language.
		Inc	rease motivation of the learner		
	Encourages communication between the learner and the instructor		Î	Learn anywhere, which results in the completion the course, and retention knowledge.	of of
	Freedom from time an space (Flexibility)	d		Create a sense of independence for the leas	mer
	Availability		M-learning	Encourages collaborat	ive

Figure 2: Features and Benefits of M-Learning (Al-Qatawneh et al., 2022)

Personalization leading to a higher engagement rate Offers Bite-sized digestible

learning

Enhances Learning and

teaching

Enhances the retention of

knowledge and recall of

information

		2. Lang	uage Dearning a		3103
Authors	Title	Year	Journal	Methodology	Finding and Advantages
Yitzhaki, Tannenbaum, and Shohamy	'Shared Education' and translanguaging; students at Jewish and Arab schools learning English together	2022	International Journal of Bilingual Education and Bilingualism	Analysis of Lessons' Transcripts, Coding System.	The study involved sixth-grade students from Jewish and Arab schools, revealing rich interactions among English, Arabic, and Hebrew, highlighting both positive and negative outcomes
Alhabshi and Abdelaziz	Developing a Multimodal Interactive Learning Environment to Enhance the Reading Comprehension of Grade 4 Students in the UAE Public Schools	2022	International Journal of Learning, Teaching and Educational Research	Developmental and design-based research approaches guided the study. The MILE was designed using the Four Components of the Instructional Design model (4C/ID) and validated in a public school in Abu Dhabi UAE	The MILE program significantly improved reading comprehension skills among Grade 4 students, particularly low- level committed students, with retelling as well as paraphrasing skills being easier to develop
Altakhaineh, Sulaiman, and Alhendi	Teaching English Grammatical Collocations to Arabic-Speaking EFL Learners	2021	International Journal of Technologies in Learning	Employed a pre-test and delayed post- test approach with 40 EFL tenth-grade students in Amman, Jordan, divided into two groups: Group A (treatment - overhead projector with guessing games) and Group B (control - printed dictionaries). Paired sample t-test was used for data analysis.	Teaching through an overhead projector with guessing games significantly improved the learning of collocations compared to traditional printed dictionaries. The most challenging collocation type was identified as noun + preposition due to vocabulary gaps and L1 interference.
Alabdulaziz, and Alhammadi	Effectiveness of Using Thinking Maps Through the Edmodo Network to Develop Achievement and Mathematical Connections Skills Among Middle School Students	2021	Journal of Information Technology Education: Research	The study used a quasi-experimental design with 49 experimental and 53 control groups, comparing pre-test and post-test scores. Recommendations include conducting training workshops and preparing Edmodo guidelines.	The study discovered a significant improvement in accomplishment as well as mathematical connection skills among students using Edmodo thinking maps compared to traditional methods, emphasizing the need for

Table 4: Theme 2: Language	Learning and	Teaching Strategies
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Ismail, Yusop, Pisal, Radzi, Atoh, Chulan, Ismail and Zaki	Monitor Model Theory as a Solution to Overcome the Problem of Mastering Arabic Grammar Among Students in Malaysia	2022	Theory and Practice in Language Studies	This paper explored the issue of Arabic grammar mastery among Malaysian students and the use of Monitor Model Theory to address this issue, examining the development of the Arabic language, curriculum, and learning methods.	professional development for teachers. This paper aimed to enhance teaching methods for Arabic grammar, thereby improving students' understanding and reducing learning errors.
Ismail, Makhtar, Chulan and Ismail	A Model Framework for the Implementation of Gamification in Arabic Teaching in Malaysia	2023	Theory and Practice in Language Studies	Secondary sources review.	The gamification approach has been proven effective in improving Arabic language mastery among students in Malaysia.
Ritonga, Pahri, Rahmawati, Tambak, Lahmi, Handayani and Riyadi	Strategies for developing tarkib arabic exercises instruments for strengthening the understanding of yellow book	2021a	International Journal of Entrepreneurshi p	Qualitative method with critical analysis approach.	Providing various training increases the ability as well as motivation of students to understand the yellow book. Here, selecting training models is arradial
Ritonga, Purnamasari, Budiarti, Lahmi, Nurdianto and Zulfida	The management of arabic language and the yellow book curriculum planning at islamic boarding schools in respond to the freedom to learn education system	2021b	Journal of Management Information and Decision Sciences	Qualitative method with critical analysis approach.	The Yellow Book and Arabic learning system lack continuous planning and evaluation; changes are required in learning objectives, resources, methods, and media, integrating ICT.
Alhamami and Almelhi	English or arabic in healthcare education: Perspectives of healthcare alumni, students, and instructors	2021	Journal of Multidisciplinar y Healthcare	Alumni records, questionnaires (instructors and students).	GPA prediction linked to English proficiency program grades; EMI presented challenges affecting academic outcomes in healthcare education
Ritonga, Widodo, Lahmi, Budiarti, Annova and Zubaidah	Arabic Learning Orientation in Mahad and Islamic Boarding Schools, and its Relevance to the Need for Human	2021c	International Journal of Early Childhood Special Education	Quantitative approach.	Graduates from Ma'had excel in speaking but are weaker in reading and writing; Islamic boarding school graduates excel in

	Resources with Language Skills in the Globalization Era				reading and writing but are weaker in speaking.
Akmaliyah, Hudzaifah, Ulfah and Pamungkas	Child-friendly teaching approach for arabic language in indonesian islamic boarding school	2021	International Journal of Language Education	Descriptive analysis.	Formal teaching of Arabic at Darunajah Islamic Boarding School aligned with child-friendly values across educators' interactions, materials, and learning processes.
El-Mneizel, Alakashee, Bettaher, Ayyat and Al- Gharaibeh	The Impacts of Lughati for Smart Education Initiative on Students' Acquisition of Arabic Language Skills at the Kindergarten Stage	2023	Information Sciences Letters	A study was conducted using a quantitative research approach, with a sample of 100 children and 100 teachers from the Emirate of Sharjah, including 50 experimental and 50 control groups participating in the Lughati Smart Education program.	The study revealed significant differences in analysis, reading skills, concepts, structure as well as achievement tests for students attending the Lughati program but no significant difference in writing skills. Teachers discovered the program helpful in developing language proficiency, reading, spelling, and handwriting. Recommendations include implementing the program across all states and public schools, linking it to Ministry curricula, and regularly updating it.



Figure 3: The Process of Mastering the Arabic Language (Ismail et al., 2022)

Authors	Title	Year	Journal	Methodology	Finding and Advantages
Al-Bustan, Al-Thuwaikh, Rajab and Al- Ghareeb	Behavioral, Emotional and Cognitive Self- Regulation of Children having Learning Disabilities in Arabic Mainstreamed and Specialized Middle- School Classrooms in Kuwait	2021	International Journal of Early Childhood Special Education	A study involving 56 Kuwaiti students from 6-9 grades discovered significant differences in emotional self- regulation, with children with learning disabilities performing better in mainstream classrooms.	The study indicated that girls in specialized classes exhibited lower behavioral self-regulation compared to boys, and mainstreamed children with learning disabilities also had lower scores. However, by grade 9, children in specialized classrooms showed improvement in self-regulation skills, which was influenced by the services provided and the necessity for teachers to receive training in emotional self- regulation
Turan and Fansa	Problems Experienced of Migrant Children in Learning Turkish	2021	Milli Egitim	The research involved 160 Syrian 4th graders from eight primary schools in the Reyhanlı district of Hatay province, using a descriptive survey model to understand the challenges they face in Turkish learning and analyzed using the SPSS program for statistical analysis.	The study highlighted that Arabic-derived words in Turkish aid Turkish learning, but students struggled with written expression. They can translate Arabic texts and express thoughts in Turkish sentences, but Turkish lessons are necessary. Syrian migrant students struggled with vowels and consonants while they could vocalize the "d" sound. The research suggested further studies on speaking skills and voice-over techniques.

Table 5: Theme 3: S	pecial Educational	Needs and	Inclusive	Education

Ihbour, Anarghou, Boulhana, Najimi and Chigr	Mental health among students with neurodevelopment disorders: Case of dyslexic children and adolescents	2021	Dementia e Neuropsychologi a	This study aimed to assess self-esteem, anxiety, and depression in dyslexic Arabic- speaking children and adolescents and described psychiatric comorbidities in these subjects compared to non-dyslexic peers. Two hundred five students from Beni Mellal- Khenifra, Morocco, participated using Taylor's Self-Assessment Scale, Beck's Depression Questionnaire, and Coopersmith Self-Esteem	Dyslexic individuals exhibited higher anxiety, depression, and self-esteem, with higher psychiatric comorbidity rates, emphasizing the need for a multidisciplinary approach in dyslexic rehabilitation care.
Elhakeem, Ibrahim, El- Maghraby and Fouad	Application of a rehabilitation program for executive functions in a sample of Egyptian children with a learning disorder	2023	Egyptian Journal of Otolaryngology	Inventory. This study aimed to implement a comprehensive, evidence-based intervention program for Egyptian children with learning disorders to improve EF skills. The program used a multimodality approach, adapting the "Executive Functions Training- Elementary" and "Promoting Executive Function In The Classroom" programs to test their effectiveness in rehabilitation.	The study significantly improved EF and dyslexia scores in Egyptian children with learning disorders. An Arabic rehabilitation program tailored for EF difficulties proved effective in enhancing both deficits. Nevertheless, additional research is needed to compare this program with other conventional interventions.

Dichara	Aggagination hotogan	2022	International	This is an	Higher Archie
DISIIara	Association between	2022	International	This is an	righer Arabic
	Phonological and		Journal of	observational	morphological as
	Morphological		Disability,	study that uses	well as
	Awareness and		Development	quantitative	phonological
	Reading		and Education	analysis to	awareness
	Comprehension			analyze data.	positively
	among Special-			5	impacted reading
	Education Children				comprehension in
	in Arab Elementary				special education
	Schools				learners,
					confirming the
					importance of
					these factors in
					enhancing reading
					skills.

#### **Discussion and Conclusion**

In conclusion, the text highlights the positive impact of technology, like iPads and MicroWorld, on students' academic achievement and teachers' attitudes toward online learning. It also emphasizes the challenges teachers face during the digital leap in education, including managing virtual classes and addressing students' mental health.

This text presents selected positive and negative instances of interactions in English, Arabic, and Hebrew among sixth-grade students from Jewish and Arab schools. It also discusses the effect of the MILE program on improving reading comprehension, the role of guessing games in teaching collocation, as well as the value of training on Edmodo thinking maps for teachers. The paper also attempts to improve Arabic grammar teaching techniques, facilitating the mastery of Arabic in terms of gamification, as well as addressing the lack of planning and assessment continuity in Arabic learning systems. In addition, the text relates the claim about EMI in health higher education, the healthcare student graduate quality among Colleges, and the child-friendly values of formal Arabic teaching in Darunajah Islamic Boarding School. Last but not least, the research suggests that the Lughati program should be rolled out in every state and public school to improve language skills as well as spelling.

It is emphasized that specialized classrooms and services are important for advancing selfregulation skills, as they tend to be weaker in children with special needs, and Turkish lessons are imperative to improve written expression in Arabic-speaking Turkish learners, while dyslexic people experience anxiety and depression at a higher rate. This will be the efficacy of an Arabic rehabilitation program for EF challenges in children from Egypt.

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# Behavioural Change Policies and Strategies for Quality Regulation in Nigeria's Education Sector

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#### Abstract

Efforts at tackling the phenomenon of corruption in Nigeria date back several decades, but success and progress have been minimal due to the conventional approach of technical fixes using the law- and-order approach. Consequently, the Nigerian Institute of Social & Economic Research (NISER) in the last couple of years has curated a body of knowledge on the Behaviour Change Approach to Corruption Control in Nigeria. This paper explores the outcome of a Participant Observation (PO) study conducted within the Joint Admission and Matriculation Board (JAMB); a regulatory body responsible for overseeing admissions into all tertiary institutions in Nigeria. The board was purposively selected as a model agency, based on a prior lived experience story collection exercise involving 614 respondents from Nigeria's public sector offices. The stories highlighted JAMB's exemplary practices, prompting its selection for in-depth analysis. Findings from the study were analysed using a hybrid framework which fuses the COM-B framework (Capability, Opportunity and Motivation influences on Behaviour) and the SOCSIT framework (Situation Analysis of Behaviour). The findings reveal that modelling and signaling (from the board's highest office) are the most critical success factors that influence positive behaviour of staff at JAMB. Other behavioural change principles deployed include (i) physical environment restructuring (ii) knowledge shaping and (iii) Motivations. NISER, based on the pilot study is working at a sustainability plan for JAMB as well as a scale up plan for other educational regulatory agencies in Nigeria.

Keywords: Behaviour Change, Quality Regulation, Education Sector, Participant Observation, Nigeria

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# Introduction

Unethical practices and behaviour in the Nigeria's education sector is a significant challenge, particularly with respect to the admission process. Entrance exams for tertiary institutions are often not based on merit but influenced by factors such as bribery, nepotism, and political patronage (Idiong et al., 2023) due to weak regulatory and institutional quality. This corrupt practice undermines the integrity of the educational system, leading to the admission of less qualified candidates and a misallocation of educational resources (Mgboji et al., 2024). Such practices distort the selection process, perpetuate inequality, and contribute to the overall decline in the quality of education.

Although, efforts at tackling the phenomenon of unethical behaviour in Nigeria's public sector, (including the educational regulatory space) date back several decades, successes and progress have been minimal. Consequently, MacArthur Foundation, in re-imagining the phenomenon, proposed a different approach to the challenge, namely *A BEHAVIOUR CHANGE APPROACH*, which focuses on addressing the root causes of corrupt behavior rather than relying solely on traditional law-and-order solutions. This underscores the emergence of the Nigerian Institute of Social and Economic Research (NISER) use of the Macarthur grant funds to provide research support for corruption control through behaviour change. Our research seeks to understand corrupt and unethical behavior, why people act the way they do and what factors exist to changing these behaviors. Thus, this study seeks to institutionalize behavioral change approaches for reducing corrupt behaviour using a pilot case of a success story recorded at one of Nigeria's educational regulatory Institutions- the Joint Admission and Matriculation Board (JAMB).

The Joint Admissions and Matriculation Board (JAMB) is an agency of the Nigerian Federal Ministry of Education. The primary mandate of JAMB is to streamline, coordinate and harmonize the admission of candidates into Nigeria's higher institutions.<sup>1</sup> This involves several processes including having a robust registration and application process, conducting the matriculation examination and ultimately having an efficient admission system. The legal instrument establishing the Board was promulgated by the Act (No. 2 of 1978) of the Federal Military Government on 13th February 1978. By August 1988, the Federal Executive Council amended Decree No. 2 of 1978. The amendments have since been codified into Decree No. 33 of 1989, which took effect from 7th December 1989. The Board is headed by a Registrar and its management team consisting of Directors heading Departments and Zonal office Directors across the 36 states of the country.

For a long period of JAMB's existence, the board had underperformed in discharging its responsibilities and fulfilling its mandate. Thus, limiting the board's ability "to be a world class matriculation, assessment and admissions board through equal opportunity and transparent services", as envisioned. The board's underperformance culminated into several cases of misdemeanor, including under-remittance to the government treasury (Figure 1). For instance, before 2016, the Board is documented to have remitted about 45 million naira cumulatively to the government coffers, but within the first year of a new leadership's tenure, (mid 2016–2017), about 7.8 billion naira was remitted to the government treasury. Subsequently, in the last five years, the Board has remitted over 40 billion naira to the Federal Government treasury, an extraordinary feat which has recently made the Board a reference point for probity, integrity and accountability. Since the inception of the

<sup>&</sup>lt;sup>1</sup> https://jamb.gov.ng/Mandate

administration that started in mid-2016 at JAMB, a plethora of reforms and initiatives have been implemented with the main goal of positively changing the attitude and behaviour of its employees for efficient and corrupt-free service delivery. Consequent upon these reforms, JAMB stands tall among Nigeria's public service agencies as a reference point of effectiveness for ethical and behavioural change interventions.



Note: A new leadership took over at the Board in mid-2016

Figure 1: JAMB's Remittance to Government Treasury: Pre & Post 2016

Against this background, NISER interrogated the JAMB success story to identify the behaviour change principles that were employed by the new leadership in tackling corrupt behaviour which was endemic in the Institution. Specifically, the study pursued two objectives (i) analyze the combination of factors influencing positive behaviour change at Nigeria's Joint Admissions Matriculation Board (JAMB) and (ii) map out strategies for institutionalizing and scaling behavioural change interventions for quality regulation in Nigeria's educational sector.

As a key regulatory body overseeing tertiary admissions, JAMB's practices provide a valuable case study for understanding how behavioural change interventions can improve and sustain governance and regulatory quality. By analyzing the behavioural change approach employed at JAMB, this paper identifies effective policies and strategies that could be scaled to other educational regulatory agencies in Nigeria. The goal is to demonstrate how the adoption of behavioural change principles can foster integrity and enhance the effectiveness of regulatory framework in the education sector. Thus, the understanding that emerges from this paper is to enable us design effective behavioral change interventions, based on the purpose of institutionalizing behavioural change as stated in the project deliverables.

# Literature Review

# Conceptual Underpinning

The conceptual foundation for this study is the Pathways of Change (PoC) framework by Vogel and the UK Department for International Development (Vogel/DFID, 2012). In

essence, the Pathways of Change (PoC) framework is a theoretical orientation and general guide to behavioral change policies and strategies to enhance quality regulation through identifying and addressing contexts, opportunities, barriers, and possibilities for applying actionable approaches to reform. It focuses on understanding the existing structures, institutions, and incentives to identify low-hanging fruits and lines of least resistance for implementing reforms with minimal resistance and maximum impact. In other words, it aims to analyze patterns of the given society, organizations, or state that will help to find which issues or approaches are likely to meet with least resistance from the target community and can thus be changed without much opposition to bring about maximum results. This approach mainly focuses on self-organisation of participants to achieve regulatory objectives including compliance, anticorruption, and institutional responsibility. In addition to this, PoC shall still embrace monitoring and evaluation to achieve incrementalism that enhances sustainability and context-appropriate shifts in the regulatory framework. The PoC thus serves as a pivotal lens for driving the desired behavioral shifts necessary for quality regulation in Nigeria's education sector.

## Empirical Perspective

Regarding the empirical focus, research on behavioural change interventions lays high importance on the practical implementation of theoretical models including; COM-B model, Behavior Change Wheel (BCW), Theoretical Domains Framework (TDF), and Intervention Mapping. Collectively, these researches provide useful information on how structured and systematic approaches can be useful in directing the process of designing and implementing interventions that can help realize the intended behaviours in different settings.

Toro-Troconis and colleagues (2021) analyze the behavioral factors concerning use and implementation of learning design approaches in United Kingdom higher education. Employing COM-B and BCW frameworks via structured interviews, their studies identify interventions such education, persuasion, incentivization, training, restriction, environmental restructuring, modeling, and enablement as critical for effectively decreasing adoption barriers. Engaging learning technologists and academic staff through these strategies enabled the advocated behaviour change on the integration of learning design methodologies into higher learning education. In the same manner, Wang et al. (2021) purposively and iteratively constructed a school-based intervention for increasing physical activity engagement among children in China. Based on the BCW and TDF frameworks, the study found that some of the interventions needed to enhance children's physical activities include: education, persuasion, environmental restructuring, modeling, enablement, training, and incentivization. It sought to embrace multiple aspects of behaviour including knowledge, skills, and opportunities to foster sustainable behavioral change.

In another development, Hankonen and colleagues (2020) explored a stepwise process to develop interventions for physical activity (PA) and sedentary behaviour (SB) among vocational school students. Using Intervention Mapping and the BCW, they determined target behaviours of self-regulation skills, outcome expectancies, and environmental opportunities. The authors called for future strategies to reduce sedentary behaviour and promote physical activity to consider individual and contextual factors, in particular to foster self-regulation and exploit opportunities in the environment.

Collectively, these studies demonstrate the flexibility and utility of behaviour change frameworks in a variety of contexts. They demonstrate that knowledge from behavioural

sciences show how interventions addressing education, environmental restructuring, self-regulation and incentivization, to name a few, can be instrumental in overcoming behavioural barriers and making change happen.

#### Methodology and Analytical Framework

#### Methodology

This research involved a mixed data collection approach. Specifically, an In-Depth Interview (IDI) and the Participant Observation (PO) data collection methods were utilized. The IDI was conducted among 41 senior, middle, and junior staff members at JAMB. These interviews aimed to understand how the staff of the agency behave, especially with respect to compliance or otherwise to rules at the board, and the factors responsible for observed behaviour patterns. Finally, Participant Observation involved sending a researcher to the board to observe the internal processes and interactions within the office environment. The researcher was tasked with understudying the agency's procedures to capture firsthand insights into how corrupt and unethical behaviors manifest in daily operations. This method allowed the researchers to identify real-time dynamics and systemic weaknesses (Shin & Miller, 2022; Sirris et al., 2022) that could enable unpleasant practices. During participant observation, the researcher works to play two separate roles at the same time: subjective participant and objective observer. This was the case in our study. Participant observation became eminent since designing a bespoke behavioral intervention for behavioural change in public agencies requires a baseline understanding of their daily processes, exchanges with citizens, and peculiar challenges. Bearing the limitations of other qualitative data collection methods in mind, especially the fact of a potential for subjective responses tweaked towards social desirability, participant observation presents with an opportunity to spot behaviour in its true form.

#### Analytical Framework

The study used an analytical framework called *COM-B* in SOCSIT (Michie et al. in 2011). The framework is a hybrid of two frameworks namely Social Situation Analysis (SOCSIT) Framework and Capabilities, Opportunities and Motivation-Behaviour (COM-B) diagnosis framework. COM-B presents a categorization of factors that influence behaviour. Each of the three COM categories have two main sub-divisions (shown in Figure 2).



Figure 2: COM-B IN SOCSIT

Undertaking a COM-B diagnosis enables us to identify what combination of Capabilities, Opportunities and/or Motivation needs to be targeted to achieve the desired behaviour change. SOCSIT also known as (Situation Analysis of Behaviour) has nine elements- Space, Actors, Activities, Actions, Feelings, Objects, Goals, Events, Time.

Our working hypothesis is that there are interaction paths across elements in the two frameworks that can be mapped. Consequently, our expectation is that COM-B influences interact with social situational influences to produce the behaviours observed within a system boundary. In order to change behaviour therefore, both COM-B factors and SOCSIT factors should be moderated. This framework resembles the Behaviour Change Wheel (BCW). However, it does not yet have elements of intervention design and policy options which form the middle and outer layers of a BCW. This is because our findings from the analysis here is what we intend to take forward to intervention design. The framework here, succinctly summarized in figure (2), enables us to have a merged understanding of factors influencing behaviour change at the board.


Figure 3: Pathways of Behaviour Change (Source: Authors' depiction based on COM-B Framework)

## **Discussion of Findings**

## Results From In-Depth Interview (IDIs)

With respect to IDIs, staff of the board at the junior, mid-level and senor cadres were engaged as respondents. The respondents were required to define corrupt behaviour in the general sense and respondents from JAMB described this as actions that are '*against due process*'. In response to what qualifies as unethical practices within their workspace, respondents from the office highlighted *bribery, abetting malpractice, result manipulation, lack of accountability and embezzlement*; of these, abetting malpractice was identified as most common. Junior staff were identified as being more involved in the most common corrupt behaviour of abetting malpractice.

In the opinion of respondents, the critical motivational factors fueling unethical behaviour were *price-income disparity, greed*, and *materialism*. The enabling systemic factor for these behaviours relate to the warped value orientation pervasive among civil servants and the institutional lapses which create loopholes that are easily explorable. In the opinion of respondents, a sufficient monitoring system and the institutionalization of a "*No Cash Policy*" will lead to reduced opportunities for unethical practices and thus create barriers to

same. They advocated *right socialization (value reorientation)* as a strategy for overall deterrence to negative behaviour and opine that all cadres of staff (Junior, medium and top level) should be targeted for intervention design.

### **Results From Participant Observation**

Findings from the Participant Observation study are documented along the lines of the Capability-Opportunity-Motivation (COM-B) and Social Situation Analysis (SOCSIT) frameworks.

### Capabilities—Actors/Activities/Objects Interactions

The actors in this observational study are JAMB officials, candidates, parents/guardians, Computer Based Test (CBT) centres' officials, service providing agencies, Ministry of Education, and Universities' officials. However, the main stakeholders in this study are JAMB officials, which comprise all members of staff of the Board, across the 12 departments with respective divisions and units. The departments have clear line of activities and schedule of duties assigned to each member of the department. The respective activities are closely monitored, and regular quarterly assessment is carried out by the quality assurance department.

In terms of rules and principles, the Board is observed to have clear and unambiguous norms and rules guiding activities and actions in the organization. These norms have been reinforced over the years, using precedence and social cues. At JAMB, there is a culture of consistent and smooth flow of unambiguous information through regular communication and meetings. In addition, there is a weekly bulletin circulated among members of staff detailing updates, critical information and weekly financial inflow and outflow of the institution (transparency and openness). Also, the Board has a code of conduct manual, detailing context specific rules and regulations from the Public Service Rule (PSR), which staff are expected to adhere to. The Board's Code of conduct manual is a simplified form of the public service rule. There is also adequate knowledge of the rules and guidelines through regular sensitization facilitated by the ACTU unit of the Board. To drive compliance to the rules and guidelines in the manual, all staffs are made to append their signature upon receipt of the manual.

### **Opportunities**—Space/Time/Actors

At the Board, structures and systems are put in place to restrict opportunities for corrupt behaviour and unethical acts. One of such is the transition to Computer-based test in 2013 which has been further strengthened in 2016. The computer-based exam has largely reduced human intervention and inappropriate acts in examination conduct and marking of scripts. The new system is principally automated with the goal of reducing human interference and improving effective service delivery. Deviant acts such as impersonation and other unethical behaviour which used to be prevalent at special centres have been curbed, as all candidates are biometrically verified during registration and on the exam date. The exam is also closely monitored through CCTV, while video clips are reviewed after exams by the Information Technology Service (ITS) officials.

The admission process itself is now technology driven with the introduction of an electronic platform known as the Central Admission and Processing System (CAPS). This technology reduces human interactions and thus reduces opportunities for soliciting bribes or patronage.

There is also no physical exchange of cash on admission transactions including at the Computer Based Test (CBT) centres. Any CBT centre found erring on any stated guidelines is flagged and delisted immediately.

Furthermore, opportunities for laxity, absenteeism and lateness to work is largely controlled as the office environment is self-sufficient with basic facilities such as Automated Teller Machine, Canteen, Vending machine, Staff Bus and well-equipped staff clinic. It is evident to state that the Board has enshrined core values, amongst which are discipline, punctuality, orderliness, honesty, probity, and integrity. Majority of staff also asserted that before the present leadership of the Board, corrupt behaviours were rampant with cases such as misappropriation of funds, embezzlement forging of signature, admission racketeering and candidates' extortion, leakage of exam questions, lateness to work and negative attitude towards work. With the inauguration of a new leadership in 2016, the occupant in the Board's highest office created a visible social opportunity for staff to emulate positive behaviour, by showing positive examples.

### Interactions With Stakeholders.

At the Board, interactions with external stakeholders are systematically restricted and this helps to positively manage opportunities for gate keeping, patronage, inducements and incentivization for service delivery. Consequently, the physical opportunities for corrupt behaviour are limited. Service delivery is technologically monitored and complaints are expected to be resolved within two hours of submission (this speaks to leveraging the Time component of the social situation at the Board for efficient behaviour of actors), except it requires management's approval. Routines are well laid out and enforced- resumption time, lunch time bracket, closing time, all reduce opportunities for idleness.

In the Board's dealing with external stakeholders such as Candidates, Parents, CBT centre, a secluded environment is arranged for clients approaching the Board for complaints as there is no form of undue interactions with other members of staff aside the SERVICOM staff who handles the complaints under CCTV monitoring. This is to prevent extortion of candidates and other corrupt influence. Consequently, majority of clients are satisfied with the services provided as the services are fast, transparent and seamless. This strategy to a restructuring of the physical space for reducing opportunities to engage in corrupt behaviour. The procedure for raising complaint is free from bureaucratic hitches and closely monitored for orderliness and excellent service delivery. Clients are guided to raise tickets through a self-help mechanism on an online platform to lodge their complaints which are promptly attended to. Majority of complaints are related to corrections on profile information and inability to access JAMB online platform. To prevent corrupt acts, only corrections are allowed on candidates' profile and not replacement of details. Furthermore, departmental tasks are interconnected to ensure checks and balances. To further check the activities of members of staff, financial transactions are made through bank and online payments, thereby limiting staff's contact with physical cash. Also, the premise is covered by Close Circuits Television (CCTV), thereby moderating the actions and behavior of staff.

## Admission Process.

One of JAMB's key responsibilities is the coordination of admission guidelines and procedures in collaboration with tertiary institutions. Since 2017, a new electronic admission system was launched known as CAPS, Central Admission Processing System. The CAPS,

which is a virtual space has replaced the physical spaces where admission processes would have been undertaken; thus, the physical opportunities for corrupt behaviour, which are related to admission racketering has been minimized. The electronic system was created to reduce human interaction and by extension, unethical acts in the admission process, to block loopholes that hitherto encouraged unethical and corrupt acts. The benefits of CAPS include: faster processing, reduced bureaucracy, transparent process. The electronic system is closely monitored for checks and balances. It was created in such way that only educational institutions have the power to give admission while JAMB approves and disapproves if anomaly is observed. With this platform, admission officers at tertiary institutions do not have physical contact with JAMB officials, thereby blocking opportunities for admission racketeering and candidates' extortion. The admission process for tertiary institutions is clearly stated and documented in an operational manual. Another system/platform built around the admission process is IBASS (Integrated Brochure and Syllabus System). This is another virtual space substitute for a service that would have transpired in physical space. The substitution naturally reduces interaction and opportunities for rent seeking. The IBASS platform has significantly improved service delivery during the registration process, it enables eligibility check and reduces the common error of wrong subject combination during registration. It is an interactive platform that engages major stakeholders (JAMB, Tertiary Institutions and other regulatory bodies in the tertiary education sector).

## Gifting Policy.

An intriguing area of interest is the enforcement of government policy on gifting. From anecdotal evidence, corruption does not often start with a direct bribe at the outset. It often begins with unsolicited and seemingly unassuming monetary inducements. In JAMB, gifts from external stakeholders are treated with caution, when a staff receives such from an individual, he/she is expected to pay the money through REMITA into the government account, furthermore, an accompanying report is submitted by the staff to the Head of Department who then reports to the Board Registrar. The researcher on participant observation at the Board further interrogated the underlying principle of this act. She was made to understand that this procedure is explicitly stated in the Public Service Rule (PSR) and code of ethics manual, and all staff are aware. A direct observation of a refund case of such nature showed a receipt generated through Remitta to return an unsolicited gift of 30,000 naira back into the government account. It was deduced that members of staff largely comply because there are checks and monitoring systems in place. There is also the awareness that such gifts could be an institutional set-up from candidates/guardian/other stakeholders. Majority of staff opined that the checks and balances which exist as a result of the systems and structures put in place largely drives compliant behaviour at the Board.

## Motivation- Actions/Feelings/Goals

Motivations come in the form of pecuniary and non-pecuniary incentives. Incentives provide a spur or zeal in the employees for better performance. These incentives provoke feelings of patriotism and commitment to the system among staff. It also provokes actions that conform to the rules among other stakeholders such as organizations in the tertiary education sector. Therefore, a hope for a reward is a powerful incentive to motivate employees. As part of measures to sustain and reinforce positive attitude and ethical behaviour among members of staff at JAMB, some of the incentives introduced especially since the 2016 administration has been geared towards efficient service delivery by prioritizing motivation to employees. Incentives such as daily free lunch, sponsored medical expenses for members of staff and their immediate family members, provision of staff buses, payment of 13th month salary, provision of examination allowance (paid annually in the month of July) and establishment of well-equipped staff clinic. Staff adduced to the fact that since the introduction of these initiatives, there has been significant drop in the number of corrupt acts such as exam questions leakage and other vices related to the services provided by the Board. The motivation of staff through improved welfare provision goes a long way in boosting staff's sense of belonging and commitment to service delivery. The institution clearly has internal documented policies to drive staff commitment and productivity.

At the Board, there are clear policy documents stating what is considered appropriate, unethical and illegal. Apart from the code of conduct manual, banners are placed along the walkways and around the premises to serve as prompts to staff. Asides motivating internal stakeholders, the Board also has mechanisms in place to motivate external stakeholders such as tertiary institutions. In the last few years, a system of annual award to tertiary institutions (Universities, Polytechnics, Colleges of Education) for various award categories was introduced. Categories such as "Most Compliant institution", "Most Improved Institution in Gender Balance", "Institution with the Most First Choice Candidates," among others.

### **Sustainability Concerns**

Behaviour change occurs within a system boundary and is often forged by champions. Regardless of how sterling the achievements of a champion are, the public service by design, will not retain a person in headship position indefinitely. This concern was interrogated by the research team. While it is apparent to note that a willing and diligent leader is critical for reform; findings indicate that the sustainability of the innovative reforms introduced at JAMB will require systems and structures built around the institution and not an individual. The present orientation and positive attitude will likely endure through steady and regular value re-orientation, mentorship and continuous training on ethical conduct and behavior and also importantly, enforcement of penalties for inappropriate behavior.

## Conclusion

The need to institutionalize behavioral change approaches within the Nigerian educational sector necessitates undertaking this research. Specifically, the study examines the combination of factors influencing positive behaviour in JAMB and mapped out strategies for scaling interventions for quality regulation in the Nigerian educational sector. Using a mixed method data collection approach through IDI and PO, the study finds that negative behaviours are largely motivated by a desire to outpace others in a competitive environment, as well as systemic factors such as low salaries, weak institutional frameworks, and insufficient monitoring. The study also underscored that unethical behaviors are more prevalent in environments that lack adequate checks and balances, such as in offices with poor supervision and enforcement of ethical conduct. However, significant strides have been made in JAMB, where reforms, including the transition to Computer-Based Testing (CBT) and the establishment of the Central Admission Processing System (CAPS), have minimized opportunities for unethical practices, reduced human interference, and increased transparency. Also, staff motivation through improved welfare provision goes a long way in boosting sense of belonging and commitment to service delivery. Despite these positive changes, challenges remain, especially in entrenching sustainability and addressing deeper cultural and value-oriented issues. Nevertheless, JAMB case study provides some useful learning for behavioural change intervention design, which are pertinent for institutionalizing and scaling behavioural change interventions for quality regulation in Nigeria's educational sector.

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## Designing Math Problems for Primary Education: A Comparation of Outdoor Mathematics and National Testing

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### Abstract

In the contribution, we focus on the process of creating math problems for pupils of all grades of primary schools. We focus on comparison math problems created with different trend, namely math problems designed for outdoor mathematics and math problems designed for national wide testing. Outdoor mathematics is implemented by a math trail, during which pupils can discover and solve math problems. These can be standard or non-standard, directly connected to real objects, which allows to see the use of mathematics in the real world. Math problems are created and solved in the application Math City Map. The national mathematics tests are intended for pupils in the 3rd, 5th and 8th grades of primary schools. Math problems are created on the base of the theoretical framework and Bloom's taxonomy. They are part of the compiled criteria tests. Math problems determine the level of mathematical literacy and are in paper form. We state necessary conditions for creating math problem in both cases. We created separated math tasks in cooperation with students - future mathematics teachers and real mathematics teachers. In the contribution, we also focus on the evaluation of separated tasks from math trails as well as criteria tests.

Keywords: Math Problems, Outdoor Mathematics, National Testing

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## Introduction

The goal of teaching mathematics is to prepare pupils learners for real life, among other things, by solving mathematical problems. The correct understanding and solving of mathematical tasks and problems can also be helped by the creation of mathematical tasks according to various criteria, e.g. creating tasks for leisure activities, outdoor activities, or national testing.

### Mathematics Trails

Motivation is an important factor that has an impact on the teaching of mathematics. Much research (See: Wilkie & Sullivan, 2017; Buchholtz, 2020) has shown that various unconventional, creative and innovative learning activities can stimulate pupils' interest in maths and foster positive dispositions. An interesting educational activity that combines outdoor learning, group collaboration and mobile technologies is the math trail.

A math trail is an engaging activity for students and the public. Participants explore their surroundings, looking for and solving math problems on objects from the real world (Cahyono & Ludwig, 2017). The tasks are placed in a walk-in area. They often require the use of different measuring tools to solve them (Ludwig & Jablonski, 2019). Math trails promote teamwork as groups collaborate, communicate, and develop effective strategies for solving problems. By linking maths to topics such as history, art, or architecture, maths trails aim to stimulate enthusiasm and deeper engagement with the subject. This approach supports the integration of interdisciplinary content into the curriculum and adapts it to diverse learning needs.

Although the concept of math trails has a long tradition, the Erasmus+ project "Mobile Math Trails in Europe" introduces a modern twist by integrating them with mobile technology. The technical framework of the project includes the Math City Map (MCM) portal and the MCM application (Čeretková & Bulková, 2020; Jesberg & Ludwig, 2012). The free MCM application allows participants to access mathematical trails on their mobile devices, which include maps, images of objects associated with mathematical tasks, and assigned challenges. Math trails are created using the MCM web portal. After a short registration, users can create their own tasks and combine them into a complete maths trail. Each math trail must consist of at least four maths problems that have successfully undergone a validation process.

Geometry problems are one of the most common tasks of math trails, and students who participate in math trails solve a variety of application problems related to real-world geometric objects. Geometry-focused math trail lead to better retention of material and subsequent development of geometric thinking, because in solving these problems, students see the direct application of what they have learned and learn to think in context. Geometry problems on the Maths Trail are always adapted to the pupils' level of geometric thinking. Suitable tasks for developing geometric thinking are discussed for example by (Bočková, Pavlovičová, & Rumanová, 2024). Math Trail tasks can be formulated at the level of visualisation, analysis, informal deduction or formal deduction.

## National Testing

In the PISA monitoring of mathematical literacy, Slovak students consistently perform below the OECD average (PISA, 2018). Some countries, like Slovakia, Denmark, responded to the

PISA results by introducing national mathematics testing (Andersen & Nielsen, 2016). Research was conducted in Sweden to examine the relationship between the TIMMS test and Swedish national measures. The result is a very strong correlation between the two tests, meaning that if a student was successful in the national test, he was also successful in the TIMMS measure (Wiberg, 2019). The aims of national wide testing are: to obtain objective information about the performance of pupils when entering the 2nd grade of elementary school, to verify the level of their knowledge and skills, the ability to apply knowledge in practical tasks and the ability to think logically, to provide schools and the general professional public with feedback and a more comprehensive picture of the students' knowledge and skills from the tested subjects, which will help in improving the quality of teaching. Mathematical tasks for national wide testing are created in the National Institute of Education and Youth in cooperation with elementary school teachers.

Problem posing is one of the important methods in mathematics education. It contains a whole group of new problems that are related to creating a problem or reshaping an already formulated problem. Problem posing can also be used as a diagnostic or assessment tool that helps teachers identify deficiencies and barriers in students' knowledge. Problem posing can also be used as a diagnostic and assessment tool (Papadopoulos et al., 2021). This method can improve the educational process in primary school. Its effective use depends on teacher preparation and appropriate integration into the curriculum. Teachers should be able to formulate and set meaningful mathematical problems for their students. The problems that the teacher poses can affect mathematics learning in the classroom and "their further mathematical goals for the class" (Ferrini-Mundi, 2000, p. 53). Teachers can use problembased tasks to learn how their students understand and apply mathematics in real life (Cai & Hwang, 2002; Cai & Hwang, 2020; Kotsopoulos & Cordy, 2009). Research by Hamidi, Soleymani, Dazy, and Meshkat (2024) also shows a connection between problem posing and problem solving on the TIMMS and the PISA measure. Many experts, as well as ministries of education in several countries, are trying to incorporate problem posing into teaching as part of curricular changes to increase mathematical literacy (e.g., Brown & Walter, 1983; Healy, 1993; Ministry of Education, Slovak Republic, 2023).

## Methodology

Our research focuses on the creation of tasks by future mathematics teachers and in-service mathematics teachers. Participants created the math trail task and tasks for the national testing.

As a research sample of future teachers, we used students at the University of Constantine the Philosopher who had already taken a course in the Didactics of Mathematics. As a research sample of in-service teachers, we used teachers who participated in the KEGA project (Innovation of Education in the Training of Mathematics Teachers in the Field of Task Creation with Emphasis on Criteria Testing) and created tasks for national testing.

The following research goals have been state:

- to create math tasks in cooperation with students future mathematics teachers and in-service mathematics teachers,
- to evaluate the task for outdoor mathematics and national testing,
- to identify the most common mistakes in the creation task for outdoor mathematics and national testing

## Criteria for Creation MathCityMap Task

Each task created in the MCM portal must meet certain criteria (Figure 1) (MathCityMap, 2024):

- Photo of the task an image of the location associated with the task, but the task cannot be solved immediately from this image.
- Title of the task corresponds with the problem.
- Definition of the task clear and unambiguous, it should be obvious to the solver what to do with the task.
- GPS position of the task every math trail task requires a GPS location of the task.
- Augmented Reality Scene provides an option to insert a link to AR scene.
- Task type can choose between different types of answers: interval, exact value, multiple choice, fill in the blanks, vector and fraction.
- Sample solution written in the form of text or in the form of an image. The sample solution must be clear and understandable for each solver.
- Hint 1- 3 each task must contain at least two hints in the form of text, image or video.
- Information about object an optional part, to be used if you want to write something interesting about the object
- Grade the grade for which the task is appropriate according to the educational standards.
- Tools you can choose tool from the list (for example set square, chalk, measuring tape, etc.)
- Tags keywords related to the task.
- Name authors name.
- Email authors email.

Creating tasks in the MathCityMap portal	Image	Basic data	Position & AR	Answer format and solution	Stepped hints	Task meta data	Author
	Photo of the task	Title of the task Definition of the task	GPS position of the task Augmented Reality Scene	Task type Addition Sample solution	Hint 1-3	Information about object Grade	Name Email
						Tags	

Figure 1: Criteria for the Creation of Tasks in the MathCityMap Environment

## Criteria for the Creation of National Testing's Tasks

Mathematical tasks in national measurements must meet certain criteria too (Figure 2):

- Tasks must be clearly specified.
- Tasks are based on real situations.
- Tasks are open or closed.
- The answer to open tasks must be a number.
- The tasks are based on a theoretical framework and are focused on a specific area of education.



Figure 2: Criteria for the Creation of Tasks for National Testing

## Results

Throughout the semester, we had the opportunity to view, evaluate and edit a wide variety of designed tasks created by future teaches and in-service teachers on the MathCityMap portal and for national testing. Different types of mistakes made by future teachers and in-service teachers in the formulation task were recorded.

## Students' Suggestions – Incorrect Outdoor Geometry Problems

In the tasks listed in this sub-section, we give concrete examples of tasks designed by future mathematics teachers. The tasks were subsequently modified. After modification, they were suitable for school practice.

Title of the task: New paint

The task required a revision of the task – definition of the task, the type of answer, the simple solution and the hints.

Photo of the task: Figure 3



Figure 3: Photo of the Task – New paint

## Original task

**Definition of the task:** How many tubes of paint do you need if you want to paint a circle of equality using just one color?

The circle with the lettering will remain on the outside. We need 17 ml of paint in a tube for 1 dm<sup>2</sup>.

Task type: multiple choice

- a. 17
- b. 5
- c. 8
- d. 4

## Modified task

**Definition of the task:** How many tubes of paint are needed to fill the inside of the circle? Leave the outer circle with the lettering. To cover 10 cm<sup>2</sup>, one tube is enough.

## Task type: interval



Sample solution:	Sample solution:
S=\pir^2	$S = \pi r^2$
$S=\pi (50,5)^2$	$S = \pi (50,5)^2$
$S=8007,785 \text{ cm}^2 = 80,08 \text{ dm}^2$	$S = 8007,785 \text{ cm}^2 = 80,08 \text{ dm}^2$
80,08:17=4,71	$80 \div 10 = 8$
4,71≈5	8 tubes of paint are enough for painting.
Hints:	Hints:
Hint 1: The circle is bounded by a black	Hint 1: Use the formula $S = \pi r^2$ to calculate
frame around it.	the volume of a circle.
Hint 2: Round off the area of the circle to	Hint 2: You will need to buy an extra tube if
the nearest whole number.	the area to be painted is larger than one tube
Grade: 8	will cover.
Tools: measuring tape, calculator	Grade: unchanged
	Tools: unchanged

### Teachers' Suggestions – Incorrect Geometry Problems

## Original task

**Definition of the task:** In art, Lenka cut paper. She cut three times from right to left and five times from top to bottom. She gave a third of the cut paper to Katka. Zuzka took two pieces of paper less than Katka. Lenka took 4 pieces of paper more than Zuzka.



How many parts did Lenka cut the paper into? Lenka cut the paper into \_\_\_\_\_ parts.

Katka received \_\_\_\_\_ pieces of paper. Zuzka took \_\_\_\_\_ pieces of paper.

Lenka took pieces of paper.

According to how many pieces of paper the girls got, sort the numbers from largest to smallest.

How many parts of the paper were left after Katka, Zuzka and Lenka took them?

## Modified task

**Definition of the task:** In art education, Lenka cut paper. She cut three times from right to left and five times from top to bottom.



How many parts did Lenka cut the paper into?

Lenka cut the paper into \_\_\_\_\_ parts.

## The Most Common Mistakes Made by the Creators of MathCityMap Tasks

Mistakes made in designing the task could be categorized as follows:

• The problem can be solved without the need to go to the place where it is located. All the data needed to solve the problem is captured in the task photo. The error is removed by cropping the photo or overlaying the search data.

Example of the task: Determine all planar geometric shapes on the railing.

Figure 4: A Task That Can Be Solved from a Photo

• Missing the units in which the dimensions of the object should be measured. The error is removed by adding the units in which the correct result should be given.

Example of the incorrect task: Determine the diameter of the column.

• The correct answer is given in the wrong type of answer. For tasks requiring measurement, the response format cannot be an exact value but an interval. The error can be corrected by changing the type of answer.

Example of the task: *How much does the cuboid stone of the bench weigh? 1m<sup>3</sup> weighs 2600kg. Give the result in kg.* 

Example of incorrect type of answer: 1349 kg

See Figure 3 for a photo of the task.

• Hints do not give relevant information. Some hints are simply a repetition of the task. The error can be corrected by the formulation of a new hint that is more appropriate.

Example of the task: *If you doubled the length of the beam, how many metrelong prisms could be placed on it?* 

Example of incorrect hints: *Measure the length of the beam. Double the beam length.* 

• The location of the problem is not correct. Students must specify the exact task location in the MathCityMap portal. The error is removed by determining the correct position of the task.

# The Most Common Mistakes Made by the Creators of Mathematical Tasks for National Testing

Mistakes made in designing the task could be categorized as follows:

- Ambiguous assignment the assignment of mathematical tasks is unclear, an inaccurate reproduction of previously seen material and what is to be reproduced is not clearly and not directly stated.
- High difficulty the math tasks are too difficult for the given age group of pupils.
- A lot of redundant data that makes it difficult to solve the task correctly.

• Overly long questions or assignments often discourage pupils from solving given math problems.

### Conclusion

In the article, we have approached the process of creating mathematical tasks from two perspectives: tasks for outdoor mathematics and tasks for national testing. Such tasks, as well as their creation, help develop creativity, mathematical and geometric thinking in students and teachers. We have focused on the criteria that must be followed when creating such tasks. We have also pointed out the most common mistakes of creators that occur in the first phase of creating tasks of both types. We have also presented the modified task assignments.

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## ChatGPT in Research: Variable Extraction and Researcher Protection in the Context of Child Sexual Abuse

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### Abstract

In the context of research on childhood sexual abuse (CSA), researchers face significant challenges due to the emotionally distressing nature of sensitive data (Williamson et al., 2020). The use of ChatGPT (OpenAI, 2023) offers valuable support in this area. This artificial intelligence (AI) tool facilitates efficient data processing while maintaining emotional distance by converting qualitative content into quantifiable formats. This approach not only aids in statistical analysis but also reduces the emotional burden on researchers (van Manen, 2023). The inter-coder reliability of this method has been evaluated and largely confirmed in various forms (Naranjos Velazquez, 2024; in press). In a comparative study, the results of AI models ChatGPT 3.5, ChatGPT 4 and ChatGPT 40 were analysed. Increased consistency was observed beginning with the ChatGPT 4 model, further highlighting the reliability of ChatGPT in processing sensitive information. This presentation explores the ethical and practical implications of AI use in research and discusses the limitations of this AI tool (Naranjos Velazquez, 2023<sup>a</sup>; in press).

Keywords: Artificial Intelligence, AI, ChatGPT, CSA, Inter-coder Reliability, Secondary Traumatization, Sexual Abuse of Children

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## Introduction

This study explores methodological and emotional challenges in researching childhood sexual abuse (CSA) and proposes innovative AI-assisted approaches. To address these challenges, this study proposes the integration of network analysis and the use of artificial intelligence tools like ChatGPT as innovative approaches to process qualitative data more efficiently and objectively. Building on these challenges, the article introduces the integration of network analysis as a novel approach to analyse survivors' self-reports of CSA. In addition, the second part of the paper explores the application of ChatGPT, an artificial intelligence (AI) tool, for extracting network data from mentioned narratives and statistically comparing results between human coder and AI. The paper demonstrates how this AI tool can support researchers by converting qualitative data into quantifiable data. The discussion also critically addresses ethical dimensions and practical implications of employing supportive AI in CSA research.

## **Challenges and Approaches in CSA Research**

## Key Challenges

In contrast to official statistics, self-reports of CSA reveal abuse rates up to 30 times higher than official reports. This self-reports are very important, because CSA is particularly challenging to detect, and it often goes unreported until adulthood, with estimates showing that 60-80% of survivors disclose their abuse only later in life (Naranjos Velazquez, in press<sup>a;b</sup>). The delayed disclosure of CSA often precludes criminal justice action, as statutes of limitations may void legal consequences. Consequently, early intervention and therapeutic support are crucial yet rarely accessible in time (Naranjos Velazquez, in press<sup>a</sup>). One of the second main challenges in this field is the emotional impact on researchers who engage with detailed survivor accounts. This work can lead to secondary trauma, where researchers experience distress like that of survivors (Williamson et al., 2020).

### Theoretical Framework: A Socio-Ecological Perspective

The disclosure of CSA involves complex social dynamics. Using a social-ecological model, in this study the roles of individual, familial, and societal factors in disclosure processes were focused using ChatGPT (OpenAI, 2023), a tool of artificial intelligence (AI) on self-reports of adult survivors of CSA (Naranjos Velazquez, in press<sup>a</sup>). ChatGPT offers a way to manage these distressing narratives, allowing researchers to process qualitative data more objectively while reducing emotional strain (Naranjos Velazquez, in press<sup>a</sup>; van Manen, 2023).

## **Research Design: Network Analysis and AI Integration**

## Data Sources: Self-Reports of CSA

The source of the data was self-reports collected from the "platform of histories" of the Independent Inquiry into Child Sexual Abuse (UKASK, 2024), with a sample size (N = 113) that includes 77 female and 36 male survivors. The UKASK platform serves as a repository for documenting the personal narratives of survivors of child sexual abuse. It aims to raise public awareness, provide insights into the survivors' experiences, and support systemic reforms by sharing these powerful stories. The platform "Geschichten, die zählen" (Stories that matter) was created to serve as a place of remembrance and to honor the life

achievements of those affected by sexual abuse, ensuring that their experiences are not forgotten. These German self-reports are openly accessible on the UKASK (2024) website. They were published based on submissions voluntarily provided by survivors. The reports were documented by UKASK through various means, including confidential hearings and written submissions. All reports were anonymized to protect the identities of the survivors, and their publication was approved with explicit consent. These self-reports provide a valuable qualitative dataset for analyzing relational dynamics and contextual variables in CSA narratives (Naranjos Velazquez, 2024; 2023<sup>b</sup>).

### Network Analysis of Survivor Social Circles

In network analysis, particularly in egocentric network analysis the social circles surrounding survivors can be studied (Naranjos Velazquez, in press<sup>b</sup>). This approach categorizes connections by strength and network size (Perry et al., 2018, p. 160); revealing essential patterns such as relationships with perpetrators and silent witnesses. For example, based on the conceptual framework of a social-ecological model, different levels of relational strength where the connection to family members may be strong but strained, while weaker ties of strangers might still play significant roles (Naranjos Velazquez, in press<sup>a</sup>). From the survivor's perspective, the size of the network is calculated as the total number of identified perpetrators or bystander (Naranjos Velazquez, 2023<sup>b</sup>, pp. 91-94, in press<sup>b</sup>).

## Application of Personal Network Analysis

To illustrate the relevance of network analysis in CSA research, initial findings based on manually coded self-reports are presented. These analyses emphasize the importance of understanding relational dynamics in the social networks surrounding survivors' members (Naranjos Velazquez, in press<sup>b</sup>). In terms of gender and silent mothers, statistical tools such as the Chi-square test ( $\chi^2 = 9.12$ ,  $\phi = -.28$ , df = 1, p < .01) revealed significant gender differences in relational dynamics with silent witnesses, particularly mothers (Field, 2018, pp. 838-839). These findings demonstrate that gender significantly influences interaction patterns with key network members (Naranjos Velazquez, in press<sup>b</sup>).

Regarding the strength of ties, Fisher's Exact Test (p < .001,  $\phi = .50$ ) was applied to assess the strength of ties between perpetrators and survivors, as well as the presence of silent mothers (Field, 2018, p. 839). These results highlight significant differences in relational strength depending on whether the mother assumes a silent or non-silent role, reflecting the intricate network structures surrounding survivors (Naranjos Velazquez, in press<sup>b</sup>).

Finally, with respect to network size, Spearman's Rho ( $\rho = 0.19, p = .04, 95\%$  *CI* [.00, .37]) identified a modest but statistically significant correlation between the network size of perpetrators and presence of silent individuals which, according to Cohen's guidelines, represents a small effect size (Cohen, 1988; Field, 2018, p. 344). These findings suggest that as the number of perpetrators increases, there is a slight tendency for the number of silent individuals in the network to grow (Naranjos Velazquez, in press<sup>b</sup>).

## Methodology and Data Analysis: Using AI for Variable Extraction

## Using ChatGPT for Data Extraction

ChatGPT's natural language processing (NLP) capabilities were employed to extract critical variables from survivor narratives efficiently (OpenAI, 2023). Using OpenAI's Playground API (OpenAI, 2024), the data was processed on a secure server hosted by IU International University of Applied Science. This approach was necessary due to OpenAI's guidelines and the highly sensitive nature of the self-reports on CSA used in this study, which made it impossible to conduct the analysis using the publicly available version of ChatGPT. The publicly available version of ChatGPT blocks the processing of such prompts to ensure compliance with ethical and safety standards (OpenAI, 2023). Additionally, the API version allows for the specification of roles such as 'user,' 'system,' and 'assistant,' enabling more controlled and context-specific interactions during the data extraction process. To further structure the analysis, role-based prompt engineering was employed.

## **Role-Based Prompt Engineering for Sensitive Narratives**

In this study, prompts were designed to utilize the OpenAI Playground API's ability to define specific roles such as "user," "system," and "assistant" (OpenAI, 2024). The system role was used to define the tone and scope of the analysis, instructing ChatGPT to process sensitive narratives on childhood sexual abuse with scientific focus and empathy. An example of a system prompt provided instructions like: *You are a scientist specializing in the analysis of reports on childhood sexual abuse. Your task is to identify key contexts while considering the effects of these experiences on the victims.* 

As documented in OpenAI's guidelines for prompt engineering (OpenAI, 2024), the user role was designed to present specific questions for variable extraction, such as identifying the perpetrator, the presence of silent witnesses, or the context in which the abuse occurred. This approach provided clear instructions for each case. An example of a user prompt included questions like:

- Who is the perpetrator?
- Were other forms of abuse (physical or psychological) also mentioned?
- Name individuals who knew about the abuse but remained silent, specifying the context (e.g., family, school, religious community).

The assistant role, representing ChatGPT's responses, structured the extracted data by listing variables or noting missing information. For instance, in one case study, ChatGPT responded with:

- Yes, physical abuse was mentioned.
- The perpetrator was a teacher.

This interaction model within the API enabled structured and context-specific responses, ensuring alignment with the study's requirements. To evaluate the effectiveness of these prompts, both zero-shot and few-shot learning approaches were compared (OpenAI, 2024).

## Comparison of Zero-Shot and Few-Shot Learning for Variable Extraction

Specific prompts were designed to identify abuse contexts, silent witnesses, and active respondents. The analysis utilized both zero-shot learning and few-shot learning to assess

ChatGPT's performance in variable extraction (OpenAI, 2024). In the zero-shot learning approach, ChatGPT was provided with no prior examples and relied solely on the prompts to extract variables. In contrast, the few-shot learning approach included five examples, selected by ChatGPT itself from the dataset coded by humans (Naranjos Velazquez, in press<sup>b)</sup>, based on the guideline to exemplify the widest possible range of variable expressions for the present study. For instance, the variable 'perpetrator' displayed diverse manifestations, as did other variables. The prompt explicitly instructed ChatGPT to compile the five examples to represent the broadest possible spectrum of these expressions, ensuring that the selected examples captured a wide variety of characteristics across the dataset. According to OpenAI's best practices for prompt engineering extraction (OpenAI, 2024), the use of carefully selected examples in few-shot learning can enhance the model's ability to generalize and adapt to complex datasets, thereby potentially improving the consistency of variable.

## Key Variables Extracted for CSA Research

Through the carefully designed prompts, ChatGPT extracted key variables, including "perpetrator identity", "silent witnesses", and "active respondents". Additional variables, such as the "context of violence", "presence of silent witnesses", "active individuals who knew about the abuse and took action", and the "age of survivors during the abuse" were also included, based on Naranjos Velazquez (in press<sup>b</sup>). These variables were critical for understanding the dynamics of abuse contexts and their broader implications for CSA research. By leveraging OpenAI's Playground API (OpenAI, 2024), the model ensured a consistent and systematic approach to variable extraction.

## Agreement Analysis Between Human Coder and ChatGPT

To evaluate the agreement between human coder and ChatGPT in extracting critical variables, inter-coder reliability was assessed using Cohen's Kappa ( $\kappa$ ), as described by Gwet (2008). Both zero-shot learning (no prior examples provided) and few-shot learning (five examples provided) approaches were applied to compare consistency in variable extraction. According to Cohen (1960), Kappa values are interpreted as follows: values below 0.20 are considered poor, 0.21 to 0.40 fair, 0.41 to 0.60 moderate, 0.61 to 0.80 good, 0.81 to 0.99 very good, and 1.0 indicates perfect agreement. This methodological design allowed for an evaluation of ChatGPT's ability to generalize and adapt to complex datasets. All statistical analyses were conducted using SPSS Statistics (IBM Corp., 2021), with statistical significance set at  $\alpha = 0.05$ .

## Results

This study organizes its findings around the performance of zero-shot and few-shot learning techniques, evaluating ChatGPT's reliability and adaptability in analyzing sensitive CSA narratives (UKASK, 2024).

## Zero-Shot Learning Performance

In the zero-shot learning approach, ChatGPT demonstrated varied levels of inter-coder reliability across different variables. The agreement for identifying "perpetrator identity" was very high (Cohen's  $\kappa = 0.88$ , p < .001 for GPT 3.5;  $\kappa = 0.94$ , p < .001 for GPT 4 and GPT 4.0) and consistent across all tested versions. The agreement for "silent person" improved incrementally with more advanced versions, from  $\kappa = 0.26$  (p < .01) for GPT 3.5 to  $\kappa = 0.30$ 

(p < .001) for GPT 4 and reaching  $\kappa = 0.64$  (p < .001) for GPT 4.0, indicating moderate agreement with the latest model. However, performance on "active person" exhibited a decline, with Cohen's  $\kappa$  dropping from 0.53 for GPT 3.5 to 0.28 for GPT 4, and further to 0.26 for GPT 4.0, reflecting lower consistency (p < .001) in identifying this variable. For "context of violence," agreement was moderate to good, improving from  $\kappa = 0.44$  (p < .01) for GPT 3.5 to  $\kappa = 0.73$  (p < .001) for GPT 4, and peaking at  $\kappa = 0.75$  (p < .001) for GPT 4.0. The variable "age during CSA" showed fair agreement across all models, with  $\kappa$  values ranging from 0.29 (p = .01) for GPT 3.5, 0.28 (p < .001) for GPT 4, to 0.26 (p < .001) for GPT 4.0.

Variable	GPT 3.5			GPT 4				GPT 4.0		
	Cohens Kappa <sup>a</sup> (к)	<i>p</i> -value	SE	Cohens (к)	Kappa <sup>a</sup>	<i>p</i> -value	SE	Cohens Kappa <sup>a</sup> (к)	<i>p</i> -value	SE
Context of violence	0.44	< .01	.14	0.73		< .001	.10	0.75	< .001	.09
Perpetrator	0.88	< .001	.05	0.94		< .001	.04	0.94	< .001	.04
Silent person	0.26	< .01	.10	0.30		< .001	.09	0.64	< .001	.09
Active person	0.53	< .001	.16	0.28		< .001	.10	0.26	< .001	.10
Age during CSA	0.29	.010	.16	0.28		< .001	.10	0.26	< .001	.10

 Table 1: Agreement Between Human Coder and ChatGPT (Zero-Shot Learning)

*Note.*  $\kappa$  = Cohen's Kappa value ( $\alpha$  = .05), a measure of inter-coder agreement Cohen, 1960); *SE* = Standard Error. <sup>a</sup>According to Cohen (1960), values below 0.20 are considered poor, 0.21 to 0.40 fair, 0.41 to 0.60 moderate, 0.61 to 0.80 good, 0.81 to 0.99 very good, and 1.0 perfect agreement.

### Few-Shot Learning Performance

In the few-shot learning approach, ChatGPT's inter-coder reliability varied depending on the variable and version. For "perpetrator identity" a very high agreement was observed across all versions, peaking with GPT 4.0 (Cohen's  $\kappa = .93$ , p < .001). The agreement for "silent person" slightly declined from GPT 3.5 ( $\kappa = .45$ , p < .001) to GPT 4.0 ( $\kappa = .40$ , p < .001) and remained relatively low. Performance on "active person" was consistently poor across (p < .05) all versions, with  $\kappa$  values ranging from .10 (GPT 4) to .16 (GPT 3.5). The "context of violence" variable showed fluctuating levels of agreement. It demonstrated moderate agreement with GPT 3.5 ( $\kappa = .45$ , p < .01) and reached its highest level with GPT 4.0 ( $\kappa = .58$ , p < .001). However, agreement dropped substantially for GPT 4 ( $\kappa = .15$ , no significant p-value), highlighting inconsistencies across model versions. The variable "age during CSA" demonstrated fair agreement, with  $\kappa$  values ranging from .20 (GPT 4) to .41 (GPT 3.5, p < .05).

Variable	GPT 3.5			GPT 4				GPT 4.0		
	Cohens Kappa <sup>a</sup> (к)	<i>p</i> -value	SE	Cohens (κ)	Kappa <sup>a</sup>	<i>p</i> -value	SE	Cohens Kappa <sup>a</sup> (к)	<i>p</i> -value	SE
context of violence	0.45	< .01	.15	0.15		.12	.08	0.58	< .001	.12
perpetrator	0.80	< .001	.07	0.80		< .001	.08	0.93	< .001	.05
silent person	0.45	< .001	.10	0.13		.13	.10	0.40	< .001	.11
active person	0.16	.01	.10	0.10		< .01	.05	0.13	< .001	.06
age during	0.41	< .01	.17	0.20		.08	.15	0.37	< .01	.16

 Table 2: Agreement Between Human Coder and ChatGPT (Few-Shot Learning)

*Note*.  $\kappa$  = Cohen's Kappa value ( $\alpha$  = .05), a measure of inter-coder agreement Cohen, 1960); *SE* = Standard Error. <sup>a</sup>According to Cohen (1960), values below 0.20 are considered poor, 0.21 to 0.40 fair, 0.41 to 0.60 moderate, 0.61 to 0.80 good, 0.81 to 0.99 very good, and 1.0 perfect agreement.

### Discussion

### Comparison of Zero-Shot and Few-Shot Learning

The analysis highlights notable differences in the performance of zero-shot and few-shot learning approaches when applied to variable extraction from CSA survivor narratives. Zero-shot learning demonstrated consistent reliability for straightforward variables like "perpetrator identity," showcasing its ability to handle clearly defined and less context-dependent information. However, its performance decreased significantly for nuanced variables such as "silent person" and "active person," which require an understanding of complex relational dynamics embedded in survivor narratives. These findings align with prior research emphasizing the challenges AI faces in addressing subtle and context-specific information in sensitive contexts (Naranjos Velazquez, in press<sup>a;b</sup>; Williamson et al., 2020).

In contrast, few-shot learning incorporated five carefully selected contextual examples to improve performance. While OpenAI's best practices for few-shot learning recommend using diverse examples to maximize adaptability (OpenAI, 2024), the limited number of examples in this analysis constrained the model's ability to generalize to more complex variables. "Perpetrator identity" continued to show consistently high agreement across versions, but nuanced variables like "silent person" and "active person" remained problematic. For instance, providing contextual examples only minimally enhanced performance, suggesting that few-shot learning's benefits are highly variable-specific and less effective for extracting complex relational dynamics (Naranjos Velazquez, in press<sup>b</sup>). The findings suggest that neither approach is universally sufficient for addressing the full spectrum of variables in CSA research. Zero-shot learning performs well for straightforward variables, while few-shot learning shows limited improvements for more nuanced variables, highlighting the need for alternative or hybrid approaches. Additionally, the discrepancies in performance across model versions underscore the importance of iterative refinement in AI methodologies to better address the challenges of sensitive and complex narratives (OpenAI, 2023; van Manen, 2023).

### Methodological Limitations and Implications

Despite the advantages of AI-assisted methods like ChatGPT in analysing sensitive data in CSA research, several methodological limitations must be considered. First, the findings indicate that both zero-shot and few-shot learning approaches struggle to extract nuanced variables such as "silent person" and "active person," even when contextual examples are provided (Naranjos Velazquez, in press<sup>a;b</sup>). This limitation suggests that the models face difficulties abstracting complex social and interpersonal dynamics often implicitly embedded in survivor narratives. The lower Cohen's kappa values for these variables (e.g.,  $\kappa = .10-.16$ for "active person") underscore this issue, aligning with prior studies that highlight challenges in modelling relational variables in sensitive contexts). Second, the use of predefined prompts poses a risk of unintended bias due to the selection of specific examples, potentially limiting the generalizability of results (OpenAI, 2024). Particularly in few-shot learning, there is a risk that the examples may not capture the full variability of the dataset, leading to systematic over- or underestimation of certain variables (OpenAI, 2023; van Manen, 2023). Moreover, discrepancies observed between models (e.g., GPT 3.5, GPT 4, and GPT 4.0) highlight inconsistencies in AI-assisted analyses, even within the same technological framework (Naranjos Velazquez, 2024). Additionally, the dataset, composed of 113 self-reports available on the UKASK platform (UKASK, 2024), while valuable, poses limitations in

generalizability due to its reliance on survivor narratives and the specific context in which they were collected. Although these reports provide a rich source of qualitative data, their scope is inherently limited to the individuals who chose to disclose their experiences. Moreover, the sensitive nature of the data necessitated strict adherence to ethical standards. To this end, all analyses were conducted on a secure internal server hosted by IU International University of Applied Sciences, leveraging OpenAI's API for structured and controlled processing (OpenAI, 2023). These findings underline the need for methodological innovations to address the limitations of both zero-shot and few-shot learning. Future research should explore the integration of hybrid approaches, combining AI's computational efficiency with human expertise. For example, expanding the number and diversity of examples in few-shot learning could enhance the model's ability to generalize. Similarly, incorporating domain-specific training data could improve AI's performance for complex relational variables, such as "silent witnesses" and "active individuals" (Naranjos Velazquez, in press<sup>a;b</sup>). Future advancements in AI methodologies must prioritize expanding the adaptability of few-shot learning while ensuring that ethical considerations remain central to the development of tools for analyzing sensitive data. By addressing these challenges, researchers can enhance both the effectiveness and the ethical robustness of AI-assisted approaches in CSA research.

### Conclusion

Using a socio-ecological model helps capture the multifaceted influences surrounding childhood sexual abuse, from individual to societal levels. Analysing personal networks reveals the roles of both perpetrators and silent witnesses, offering deeper insights into abuse dynamics. Survivor self-reports provide essential variables, ensuring data directly reflects their experiences. The integration of ChatGPT's natural language processing capabilities has proven valuable in extracting key variables, enabling more systematic analyses while maintaining emotional safety for researchers. Strong inter-coder agreement on specific variables, especially with provided examples, enhances data reliability. However, challenges in extracting nuanced variables, such as silent witnesses or active bystanders, highlight the limitations of AI in addressing complex relational dynamics. Strict ethical standards and data protection are upheld to ensure survivors' privacy and dignity. Future research should explore hybrid approaches that combine AI efficiency with human expertise to address these methodological challenges.

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## Does Practice Make Perfect? Teaching Technically Demanding Content in Distant Mode in Higher Education

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### Abstract

This paper presents experiences of teaching technically demanding content in online and higher education context by utilizing learning analytics. The aim is to study how students learn technically demanding content in an online course in the light of learning analytics. The results of this paper are based on a pilot course implementation. The pilot course, Basics of data analytics, was taught as virtual, open university course during Spring 2024 in Finland. In the course implementation, students were provided distance learning materials, and they had practical SQL exercises that were provided through Azure Data Studio cloud service. In the final course examination that was provided through a learning platform called Moodle, students were tested by filling up SQL sentences. The virtual learning environment, including the SQL server, Azure Data Studio and Moodle, provided the possibility to follow the amount and quality of the students' practical rehearsals. These were then further compared with the measurable examination results that the students' gained in the end of the course. The full paper presents the results of the learning analytics and shed light on the further development of teaching technically demanding content in distant mode.

Keywords: Data Analytics Teaching, Online Teaching, Learning Analytics

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## Introduction

Timely access to knowledge and inspiring hands-on exercises play a critical role in students' learning in technically demanding topics, such as data analytics courses. Hands-on learning environments are needed to provide practical insights when teaching abstract concepts (Gupta, 2023). Thus, teaching of relevant tools for students to better learn data analytics is in essential role (Zheng, 2019). Furthermore, it would be beneficial to have such rich environments for learning that take into account also the human and social aspects and leverage the human approach and abstract thinking (Medina-Hernández et al., 2022).

According to previous studies, teachers have brought up a high level of interest, but rather limited capabilities in learning analytics development (West et al., 2016). Especially in teaching data analytics, it can often happen that teachers which don't have a strong background in data analysis and statistical methods face challenges in identifying both the potential benefits and challenges of learning analytics (Kiwelekar et al., 2022). However, it would be beneficial that teachers recognize their students' competence development already during the course. This requires that teachers have timely access to the learning data and furthermore, that they also have the necessary competencies to perform appropriate analysis of the students' learning. They would need more engagement with potential educational technologies and analytical tools to develop teaching and learning experience (Halibas et al., 2019).

This paper presents experiences of teaching and learning technically demanding content in online and higher education context by utilizing learning analytics. The aim is to study how students learn technically demanding content in an online course in the light of learning analytics. The results of this paper are based on a pilot course implementation. The pilot course, Basics of data analytics, was taught as virtual, open university course during Spring 2024 in Finland. The course was comprised of two sections, infographics (2,5 ECTS) and SQL (2,5 ECTS). SQL skills are of high importance in learning data analytics, so these skills were taught in the course very practically. Firstly, students were provided distance learning materials. Secondly, they had practical SQL exercises that were provided through Azure cloud service. Thirdly, students made examination in Moodle learning environment. In this examination, students were tested by filling up SQL sentences. The virtual learning environment, including the SQL server, Azure Data Studio and Moodle, provided the possibility to follow the amount and quality of the students' practical rehearsals. These were then further compared with the measurable examination results that the students' gained in the end of the course. Additionally, students' own perceptions on their course experiences were gathered through a small survey.

In next, we will first shortly open the bases of learning analytics and then we will present the empirical case study, followed by opening up the key empirical findings. The paper is ended with conclusions and discussion.

## Theoretical Background: What Is Learning Analytics?

According to a widely used definition, learning analytics refers to an overall process that includes the phases of collecting, measuring, analyzing and reporting of data about the students' activities aiming to understand and optimize the learning processes, but also the environments for learning (Long & Siemens, 2011). To collect, analyze and report the data effectively, technology solutions are applied. In fact, modern learning analytics connects two

worlds: the world of learning—referring to educational research and pedagogical strategies and the world of technology—referring to data analytics, visualization techniques, and artificial intelligence. Modern learning analytics builds on long-term developments in both of these fields, providing new insights into how people learn and furthermore, leading towards opportunities to enhance the effectiveness of learning programs (Clow, 2013; Nistor & Hernández-Garcia, 2018).

Examining and measuring the data collected on learning platforms is key area in learning analytics. Hernández-de-Menéndez and colleagues (2022) have carried out an extensive review of learning analytics and they provide a comprehensive discussion on the data sources of learning analytics. The digital footprints of student activities left on learning platforms tell about the learning process and help monitor and analyze it in real time. Data can be used to support the student and produce automatic feedback and adaptive tasks to guide the student in the right direction. It is important to keep in mind that learning analytics in many ways. For teachers, learning analytics can provide, for example, information on course fluency, the functionality of pedagogical elements or assessed prerequisites. With the help of data, the teacher deepens the understanding of the learner's experience and develops teaching. This in turn frees up time for personal interaction with the student. For a student, learning analytics can mean, for example, information about workload and graduation based on credit accumulation, or suggestions for courses or necessary actions, such as registrations.

In fact, learning analytics can be examined at several different levels of actors. The actor level determines the contexts in which information is used. It is important to identify the contexts and the purposes of data use in order to clearly define data protection issues related to different situations and also the ethical issues (Zilvinskis et al., 2017). In overall, learning analytics can be the key success factor in future teaching, helping learners find their own path towards top learning outcomes. At best, it can provide a view of the learning experience, motivation, well-being and personalized competence development. Students can receive personal feedback and support for independent learning at just the right time (Hernández-de-Menéndez et al., 2022).

## **Empirical Case: Data Analytics Virtual Course Implementation**

The empirical case of this study is virtual course implementation of Data analytics. This was a pilot course named as "Basics of Data Analytics" and it was provided as open university course during Spring 2024 in Finland. The course was in total 5 ECTS and it was comprised of two sections, infographics (2,5 ECTS) and SQL (2,5 ECTS). In this paper, we concentrate on the SQL part of the course implementation due to its rather demanding technical content. SQL skills are of high importance in learning data analytics, so these skills were taught in the course very practically. Firstly, students were provided distance learning materials. Secondly, they had practical SQL exercises that were provided in SQL Server database management system. Students connected to SQL Server in Azure cloud service using Azure Data Studio program. Thirdly, students made examination in Moodle learning environment. In this examination, students were tested by filling up SQL sentences. The virtual learning environment, including the SQL server, Azure Data Studio and Moodle, provided the possibility to follow the amount and quality of the students' practical rehearsals. These were then further compared with the measurable examination results that the students' gained in the end of the course. The course implementation and the supporting technical tools and platforms are illustrated in next Figure 1.



Figure 1: SQL Learning Environment

## **Key Empirical Findings**

Learning analytics solutions integrated in the online course implementation enabled us to monitor the student's activity in the virtual learning environment, see following Figure 2.



(The amount of practical training and the success varies a lot from student to student.)

Training increased towards the end of the course (Figure 3). At the same time the mount of the right SQL-sentenced didn't improved in the same proportion. Possibly the reason is that students wrote more difficult SQL-sentences at the end of the course.



Figure 3: Amount of Training and Success and Average of SQL (*Training increases towards the end of the course, but success in training does not improve in the same proportion.*)

We were also interested in to analyze what kind of results were achieved with the learning environment as well as what was learned in the end based on the exam results.

In overall, students did very well in the course. Altogether 65 students took the exam, and of them 60 students passed the course and thus received the badge for SQL. The requirement to pass the course was half of the exam assignments correct. However, the students did far better than this, as the exam yielded an average score of 27.26 out of 35 points. Thus, 77.9% of the completed SQL statements were correct in the exam.

When looking at the learning analytics data more carefully, we can draw the empirical conclusion of this case course that students achieved better exam results when they practiced more, see following Figure 4.



Figure 4: Correlation Between Amount of SQL (Practice improves exam success.)

In following Figure 5 we can also see that students did better in the exam when they had practiced more difficult SQL sentences and not just tried the easier ones.



Figure 5: Correlation Between Success in Training and Success in Exam, and Correctation Between Difficulty of SQL (*You will be more successful in the exam if you have practiced more difficult (longer) SQL sentences and managed to get the correct answers in the exercises.*)

It is also important to get insight on how the students perceived studying in this kind of technically demanding content. This kind of student feedback was gathered after the course through a small survey that included both numeric evaluations and open ended questions, where students were able to leave free-form feedback.

Based on the open-ended questions that students felt that the best thing about the course was in overall the SQL part as they felt that in that part, they learned a lot. As one of the students stated, "The SQL part of the whole was the one that I felt I learned the most from". However, at the same time the SQL part was the most challenging part of the course SQL - studying the language "It took me a really long time to understand the logic of SQL". This was partly because this area of the course was the newest one for many students, as stated "SQL language was completely new, I've never programmed. It was quite challenging to take control of things, and therefore perhaps remains detached from the practical level." Some of the students also were uncertain of the way that they should have practiced the SQL sentences as there was mentions like "Perhaps in this section you could have been directed to use or utilize Chat GPT. Personally, I didn't utilize but instead tried to practice commands traditionally." It can be argued that if the student would have used Chat GPT in the rehearsing it would not increase the student's own competences and thus, would have been visible through worse exam results.

Although SQL is quite theoretical and difficult to understand why it is needed or what to apply to in daily work, the answer regarding the entire course was that learning was useful (full course content infographic, SQL, Power BI basics), as illustrated in following Figure 6.



Figure 6: Course Evaluation (*The course was considered necessary [including sections infographic, SQL Power BI basics].*)

### **Conclusion and Discussion**

Previous literature has highlighted as one of the key challenges that teachers face in teaching data analytics the lack of practical guidelines for building hands-on experiences and training in the use of new technology. In this paper, we have presented a pilot course implementation of data analytics course, which included practical hands-on exercises for students and provided integrated learning analytics solutions. Through presentation of the results of the learning analytics we hope to provide inspiration for further development of teaching technically demanding content in distant mode and inclusion of learning analytics in this kind of teaching.

Firstly, based on the results of the empirical pilot study we can conclude that the learning outcomes of the course in relation to practical hands-on exercises is that practice pays off in learning this type of content. However, in the pilot course implementation there were 18 students who did not practice any SQL statements. Their result varied from almost full points to 12/35 points (pass limit was 50%). This indicates that the students enter to the course with varying competence level in data analytics, and this further affects the amount of practice that they need for good learning outcomes. These kinds of results of the learning-promoting effect of practical exercises are not very surprising and new but has now been tested in the context of data analytics teaching.

Secondly, based on the empirical results the key notion regarding the utilization of learning analytics can be concluded as following. To really get the full potential of learning analytics to develop the course and to support the student it would be required that the teacher could monitor the amount of practice already during the course. In addition to the number of

sentences, the number of successful sentences in relation to practice tells quite a lot. If most of them can't produce correct SQL statements despite practice, there is something wrong with the whole teaching. It is no longer about what the individual student does. The quality of training may be more important than its quantity (quality=difficulty level of tasks+success) and thus in the interest of learning analytics. Another thing is how easily this technical implementation can be made real-time, but whether the individual SQL language is essential enough in relation to the workload required to build analytics.

We also have some limitations in our study. Limitations are connected to the difficulty of SQL sentences and the correctness of SQL sentences. Our environment doesn't include the logic of SQL sentence, only the sentence syntax. The same SQL sentence can be written in many correct ways but SQL Server only checks that the sentence has the right syntax. In the basic course we concentrate on writing syntactically right language. The difficulty of SQL sentences are always longer because they need more definitions. These selections are accepted but have clear limitations.

In the future it will be beneficial to develop the environment automatic. In this study the part of manual work is rather big. Even the exercises and database are changed the Power BI interface and log data analytics are useable without enormous work. Secondly, we are interested in studying how students learning results change if the material provided is improved. We plan to make video material of SQL language and to offer students contact possibility with the teacher.
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# From Barriers to Bridges: The Role of Community-Based Preparatory Institutions as Pathways to Higher Education

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#### Abstract

Educational participation is shaped by social factors, impacting access and mobility (Chanana,1993; Filmer et al., 1998; Hasan & Mehta, 2006). Multiple interventions have addressed this, including enabling easier access and providing added support within institutions, among others. This paper particularly looks at how identity and communitybased preparatory institutions support higher education access for marginalised students along class and caste lines. Preparatory institutions broadly have been overlooked (Bray, 1999; Stevenson & Baker, 1992) despite being part of India's higher education sector, and further they can also worsen social inequalities by serving only those who can afford them (Majumdar, 2014). However, some of these institutions have enabled access for students with fewer resources and from marginalised groups, by leveraging their community and identity ties. The study aims to examine how such select preparatory spaces shape its students' experiences, and everyday emergent practices, and how such practice intersects with identity negotiations. In our paper, we will highlight some interesting patterns that emerged and the preliminary insights we are working with. They include 1) The interplay of formality and informality within preparatory centres. 2) How stakeholders' everyday practice shapes their understanding of margins and marginalities. 3) And how the thread paying back to society underlies all strategic intent and emergent practices. These emerging patterns lead us to think about preparatory spaces as an integral part of the learning trajectories of marginalised students - not only supporting the understanding of subject areas but also supporting the intangible parts of educational trajectories like the sense of belonging, campus climate and the claim to spaces.

Keywords: Access to Education, Preparatory Spaces, Marginalisation, Informality, Higher Education

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## Introduction

Literature has long affirmed that educational access and involvement are shaped by social contexts (Chanana, 1993; Filmer et al., 1998; Hasan & Mehta, 2006). As the higher education system in India continues to expand, equitable access becomes an important consideration. Studies have looked at structured exclusions in Indian higher education focusing on exclusions based on gender, caste and class (Chanana, 2011; Deshpande, 2006; Gautam, 2015; Tierney, Sabharwal & Malish, 2019). Data indicates (NSS, 75th round<sup>1</sup>) that some sections are more likely to undertake certain types of higher education while some are likely to be left out of it, usually marked along lines of caste, class, gender and other markers of difference.

Post-liberalisation the purpose of education turned more market-oriented, shifting from being a public good to a mode of servicing the global economy with emphasis on 'return on investment' (Arnove, 2003; Kamat, 2011; Slaughter & Rhoads, 2000), as education became privatized. Only those who can self-fund their education affords it while people from lower economic backgrounds, who are more often than not also members of lower social groups, stay away from them (Shah & Lewis, 2010). The promise of opportunities and broader social mobility the education system held for disenfranchised populations—the reservation system for instance, dwindled (Benjamin, 2008).

The desire to attain higher education has led to a rise of preparatory extra-institutional spaces like training centres (Aurini, 2013; Azam, 2016; Ørberg, 2017, Punjabi, 2019), that help students gain access to reputed institutions like IITs and NITs. Gaining access to these institutions is their gateway to upward social mobility, and into the "New India" (Kaur, 2012). Preparatory spaces have also to some extent tried to bridge the gap by claiming to make quality education available to many, something most formal education spaces lack (Jha, 2011). Experiences in these spaces are as formative as experiences in the higher education institutions they prepare their students for (Ørberg, 2017). However, the financial and temporal demands of such institutions leave them available for only the higher-income groups. Aspiring students from underrepresented communities are often short-changed while accessing expanding higher education opportunities, based on their class and caste positions. Community-based preparatory spaces provide a bridge for such students. These spaces pivot singularly on the community and identity-based affiliation, with an embedded understanding that aspiring learners from such spaces are inherently less likely to be able to access formal higher education.

Our paper examines how higher education access is enabled for students coming from traditionally disenfranchised populations – along class and caste dimensions, through identity and community-based preparatory institutions.

# The Phenomenon of Preparatory Spaces

Preparatory institutions are extra-institutional spaces that help students gain access to reputed higher education institutions, both within the country and abroad. A subset of these spaces focuses on entrance exams, enabling a trajectory into a world of work. These preparatory

<sup>&</sup>lt;sup>1</sup> National Sample Survey Office (NSSO) is a government nodal agency responsible for conducting large scale sample surveys, the National Sample Surveys (NSS), in various fields at the national level through nation-wide household surveys. The survey period of the 75th round lasted from July 2017 to June 2018, covering the subject of Household Consumer Expenditure.

institutions play a pivotal role in a learner's educational trajectory and upward social mobility. There is also a particular subset of preparatory spaces that pivot on community and identity-based affiliations, which have played an important role in enabling access for aspiring students who come with fewer resources and from historically oppressed sections of society. The study explores student and stakeholder<sup>2</sup> experiences in select preparatory spaces using qualitative methodologies, including narrative inquiry and reflexive methodology, to uncover both experience and everyday practice. Further, it examines everyday practice and negotiations of identity and belongingness against the backdrop of access to higher education and professional spaces, and their promise of social mobility and emancipation.

Community and identity-based preparatory spaces then provide opportunity and social mobility and are essentially figured worlds (Holland et al., 1998). The proposed study aims to understand the various dynamics inherent to extra-institutional preparatory spaces and imagined (aspirational) trajectories. This is particularly relevant as in the Indian context, class and caste, and their various intersections can work as critical pivots on which identities entangle in everyday emergent practice.

# Theoretical Framework

Theoretically, the proposed study is situated at the intersection of equitable access, epistemic justice and identity negotiation. Fricker (2007) explains epistemic injustice as "a wrong done to someone specifically in their capacity as a knower". She identifies two varieties of it, testimonial injustice and hermeneutical injustice (Fricker, 2008). In preparatory spaces, the idea of epistemic injustice provides direction on how to make the voices of diverse knowers heard. It also allows us to keep in check the unjust conditions for creating, distributing, and accessing knowledge (Fricker, 2007).

In terms of equitable access, Raftery and Hout (1993) while articulating Maximally Maintained Inequality (MMI) argue that educational expansion does not usually reduce educational inequality between social strata, till the higher social strata reach educational achievement saturation; and Lucas (2001) adds that even within saturated levels of attainment, disparities are created by socio-structural inequalities, Effectively Maintaining Inequality (EMI). Lucas' (2001) work further refines this emphasising that inequality can be "*effectively maintained*" through increased differentiation (Weis, 2010). Our paper draws on this learning to understand the phenomenon of expansion and unequal benefits in the Indian context and the ways in which community and identity-based preparatory spaces disrupt or add to this understanding of both MMI and EMI.

The proposed study also engages with identity and its various negotiations. The key parameters of inquiry in the proposed project include questions of identity, experiences within sites as influences on identity, and everyday practice and self-reflexive engagement. Over here we draw the work of Stuart Hall (1996a), and identity construction. Identity is fluid and is fixed (sutured) only in the choices made by the subject in specific times and spaces, (Hall, 1996a) and is constructed only concerning an 'Other', its constitutive outside' (Hall, 1996b, p. 4). Building on this, Fine and Weis (2005) suggest that identities are constructed in relation to constructed identities of others, as well as dialectically in relation to the broader economy and culture (p. 68). Holland and colleagues (1998) articulated the concept of

<sup>&</sup>lt;sup>2</sup> Stakeholders in our study encompasses everyone in the ecosystem of preparatory spaces, barring the learners (the students). They include people who have founded these spaces, who mentor the learners, who run the administrative tasks, who ensure funding and outreach, and who train new mentors, among others.

"Figured Worlds", to explain and understand the construction of identity and self, and the essaying of practice.

## Methodology

We made use of a combination of methods to get a holistic view, including interviews, and focus group discussions. Our study aimed to situate, not only the data collected but also the process of such data collection, in socio-cultural, historical and political contexts relevant to such an examination (Fontana & Frey, 2005). The project uses principles of *narrative inquiry* for informal and formal articulations of experiences (Webster & Mertova, 2007), framing a method that excavates experience, intending to understand how identities are constructed and everyday practice articulated.

The identified sites of intervention are community and identity-based preparatory spaces located in Maharashtra, New Delhi and Tamil Nadu. These spaces encompass a range of strategies, and a history of work, aimed at enabling higher education access for students from disenfranchised groups.

#### **Insights and Discussion**

The study is still in progress, but some interesting patterns have emerged from the initial data analysis. Some of the rudimentary insights we discuss in this paper centre around:

- 1. Formality and informality *What does formalisation mean to these spaces? When does someone become formal?*
- 2. Margins and marginality *What are the practice-based definitions of what the boundary for marginalisation is for these spaces?*
- 3. Stakeholder strategies What strategies make their practice possible?
- 4. Pay Back To Society What is the ideological thread that runs through everyone's practice?

# Formality and Informality

A key theme that emerged in our work is the interplay of formality and informality. These happen at multiple scales covering individuals, organisations and networks. More often than not the preparatory centres are nebulous spaces with a loose collection of individuals who come together intending to help students gain access to higher education spaces. While in some cases these organisations are more formalised. This has implications for how the practice of mentorship and support plays out in the every day.

In exploring the relationship between formal and informal practices, it is important to recognise that being formal isn't the only way to engage in this space. There is also a significant amount of grey area between the two. Recognition plays a key role; being recognised allows individuals to access certain opportunities, while non-recognition—often linked to informal practices—opens up other avenues. This highlights the importance of community in these practices.

For example, one of our site's recognised status shaped its teaching methods, leading to structured initiatives like the "100 hours of practice". In contrast, another site represented a more informal approach, relying on word-of-mouth and emphasising lived experiences over traditional content. Similarly, a third site focuses not on formal pedagogy but on providing

practical support for admissions, such as writing Statements of Purpose (SoPs), getting letters of recommendation etc.

The selected quote from our transcript below, that address the topic of formality and informality in practice<sup>3</sup>:

"So, we started in 2021, actually, we worked informally in different spaces and in 2021 we brought it into a formal legal setup. I always thought that I will run a movement, but I realized movements don't survive. You need to have this legal entity. The government wants to see how much money is coming in, how we are doing, that we are doing good. So, then the government will not let us work. So, we got ourselves registered."

The following excerpt explains their reliance on non-physical modes of communication to enable informal practice:

"We don't have any office space or we don't have any physical infrastructure. Whatever we work (is) mostly based on virtual or non-physical sort of modes of communication. [...] Post Covid, things are quite important because we have access to those virtual networks like GoogleMeett or Zoom or any sort of, like- So, I think in our initiative, I would say we have access, I mean, students approaching through social media. So, like, we have - we tried to be visible at (on) all sorts of social media, like LinkedIn, Facebook, Instagram, everywhere! Because I think this is one of the emerging modes of communication and connection."

#### Margins and Marginalities

Stakeholders while defining and executing their everyday practice—whether emphasising soft skills or language proficiency—shape their understanding of margins and marginalities. For several organisations, the challenge has been in defining what is the practice of emancipation and social mobilities for the marginalised. Several stakeholder groups we spoke to are engaging with thinking about empowering trajectories for their learners. In Maharashtra, where most of our fieldwork so far has been conducted, balancing aspirations for higher education and government jobs poses a challenge, and stakeholders guide students through this complex process.

This emergent practice of mentorship and support then begins to define what *margins and marginalities* are. As these stakeholders define and execute their everyday practice, there are key understandings of marginalities that they work with. Some stakeholders emphasize the skills - particularly soft skills and some others on language. For one particular group mentorship and support is a collaborative endeavour with higher education institutions leading to the development of a curriculum which includes 100 hours of training. For several others, the challenge has been in defining what is the practice of emancipation and social mobilities for the marginalised.

<sup>&</sup>lt;sup>3</sup> (N.B.) The text in normal orientation were spoken verbatim by our respondents. Thoses in italics have been translate from a vernacular language. Marathi and hindi were the vernacular languages spoken by our respondents and the members of the research team were fluent in them. This applies for all the excerpts from transcripts shared here.

Several stakeholder groups we spoke to are engaging with thinking about empowering trajectories for their learners. In the state of Maharashtra, where most of our fieldwork so far has been conducted, balancing aspirations for higher education and government jobs poses a challenge, and stakeholders guide students through this complex process. In many ways, these two are pitted against each other and the stakeholders help learners navigate this process.

The following section from our transcript speaks to this:

"So, you have, on one end, people who mostly need just the technical help, but that's a very small group of mentees, I must say. A vast majority lie on the other side of the spectrum. Primarily people who have- like this is a space that they aspire to be in, but they don't know how to be in this space. So, you have to motivate them, you have toonce again, role modelling, affinity-based mentorship helps quite a lot there. But you also have to help them with the most basic queries. You know, sometimes you would feel like, 'I mean, you could have googled this', is what you could feel. But then at every point, you have to think that maybe this is the first time this student is even exploring these things on Google and, you know, Google throws millions and millions of tips of information at you and even the most straightforward thing will feel like, 'Oh, one website is saying the deadline is in June, the other website is saying in May. I don't know what the official website is.""

The following quote outlines the details of one stakeholder's college-to-career program:

"So, now we run two programs, three programs, actually. One is, we call it a collegeto-career program. What is a college-to-career program? The college-to-career program is a 100-hour program. Any student who wants mentoring has to register for the college to career. It includes academic writing, critical thinking, English speaking, you meet some people who are admitted to good universities, there is a piece related to mentoring and scholarship, you complete that and 100 hours are complete. [...] We want to take it ahead, but can we work with an audience where we can start helping children make informed career decisions."

The quote below emphasises one stakeholder's efforts in facilitating student transitions and legal documentation:

"What we call it [is] enabling students to make school to college, college to career transition, unlocking the scholarship and legally documenting the undocumented. Now, with some of the students out of these, we can only do this work. We get them legally documented and our intervention is done. For some children, we unlock scholarships and our intervention is done. We try to do all of it together, but it doesn't necessarily happen that way."

# **Stakeholder Strategies**

This brings us to understanding stakeholder strategies. As mentioned earlier, the idea of margins and marginalisations can be constructed through emergent practice. It is also useful here to then break down some interesting emerging cases on stakeholder strategies that make this practice possible. On the field, we also noticed cases of stakeholder strategies that make this practice possible. Focus on institutional partnerships; leveraging online presence and

networks; and prioritising employment pathways; are some of the many strategies we witnessed.

One of our sites focuses on institutional partnerships, while others rely on online presence and networks, and another's strategic focus is on employment. One specific organisation we looked at emerges and works through a strategic partnership (sometimes strained) with the Buddhist religious foundations. Community centres like Buddha Viharas and libraries have a very important strategic space in this endeavour. Such spaces help in creating a community of learners that are otherwise absent in the lives of students. A shared experience allows students to articulate a trajectory emerging as a coproduction of the meaning of the spaces of higher education themselves.

Online spaces, on the other hand, while creating a community, also rely on access to technologies that may not be present in other students' lives. There is a level of stratification that becomes visible here - highlighting the fact that the condition of being disenfranchised is not homogenous in itself.

This section from our transcript reflects this idea:

"So, we had a lot of discussions over this at the initial level that if we put the word Buddhist, then people will say that these are the Babasaheb people. Basically, we did not keep it with that thought, we kept Buddhism from a very broader perspective. When we say Buddhist, we mean apart from caste. So, we got this concept only with time. So, then we, if we want to do this, then to break caste, we will have to bring caste together. So, to break the caste barrier, we started reaching out to other communities as well. But we kept one context the same, which was education."

The following quote explains how they conduct outreach sessions for universities:

"So, the one one-on-one [mentoring] and all of this mostly happens online. [...] Wherever possible, we did a few in-person outreach sessions as well, but we did specific online outreach sessions for these universities. We told them, you know, on this day we are going to do an outreach session. It would be great if you could share it with your students, etc. And then we also worked with some, you know, on-the-ground organizations, like community initiatives."

#### Pay Back to Society

However, across all these strategic intent and emergent practices, the one underlying thread that emerges is that of paying back to society. A lot of the practice that we are talking about and seeing in the field is very reliant on the practice of giving back. Stakeholders and learners alike attribute this ethos to Buddhist and Ambedkarite thought. More than just an ideological position, we found that this aspect is central to the continued existence of many of the mentorship and support systems.

Some ways in which this manifested was through sharing of mentors among different such spaces; student movement between preparatory spaces where students from one space would go to the other; and past students coming back to mentor or coming to one/two day camps.

The following passage from our transcript provides insight into this theme:

"If you look at the so-called identified preparatory classes or in terms of very commercial sense, like coaching classes, the tutorial classes, most of the students who are coming from marginal background, either it's the caste or class or gender (or) religion. So, probably they are not able to afford those (that) fees because it's really, really quite expensive. Like, if you want to prepare for NET, JRF or if you want to prepare for any sort of intense examination. So, these coaching institutions are quite expensive and it's mostly students from the economically and socially deprived backgrounds. They can't access those institutions. [...] So, these non-academic institutions become quite inaccessible for the socially or economically unprivileged students, so they can't afford."

Here, the stakeholders and mentors talk about the achievements of their students and their role as future mentors:

"So, it's (been) almost five years of running this initiative and we have mentored, I think, more than 100 of students, we have sent to the Ph.D. and M. Phil. admissions, including IIHS. Like, every year, two, three students are going to (the) Urban Fellows Program. And when they came (come) back after completion and all, they are the new mentors, they are the new trainer(s), they are the new leader(s). So, this is the way, I think the principle where you pay back to your society, pay back to your community, what Dr. Ambedkar used to say."

This quote identifies the challenges faced by the stakeholders in providing information about fellowships:

"And there was one challenge, that there was no information about [fellowships] on the website. place for preparation from where the students could get the preparation. happening, you are preparing for the UPSC such as the interview is like UPSC only but there selection process is different. More about your personal achievements and challenges, struggle and everything then they got selected. So this is the gap we see and none of the community is doing this we started doing this. So mostly our focus was on tier 2 and tier 3 cities."

# **Challenges and Opportunities**

The site itself presented us with many challenges and opportunities that made us rethink our own research practice in terms of enabling the co-production of knowledge. The design of the study intended to look at higher education as a space of emancipation, and preparatory sites as formal centres that help in this overall process.

But, our initial attempts at entry into the site troubled both of those notions. The design of the study, we found, was not adequate to grasp the nature of emancipation, empowerment and mobility. Higher Education was not even the primary option for learners, as we found, and some of the work that networks and stakeholders were doing, was to introduce higher education as an alternative to government jobs.

Secondly, the informal nature of networks and the underlying ethos of giving back was ironically leading to a practice and space that was both ephemeral in some senses, but durable. These learnings led us to redirect our inquiry at the conceptual level to understanding different dimensions of mobility. We began rethinking who our respondents

would be (moving from formal institutions to informal sites of practice) and also our conceptions of access to that of mobility.

A key aspect to emphasise here is that as primary researchers investigating phenomena, we relied a lot on extant literature. Mid-way through the project we had two interns joining us who themselves had been through preparatory spaces. This change in the research team helped change the nature of insider/outsider negotiations, across multiple dimensions including language.

As we began rethinking who our respondents would be (moving from formal institutions to informal sites of practice) and also rethought our conceptions of access to that of mobility, we were able to then gain entry into such spaces. A key aspect to emphasize here is that as primary researchers investigating phenomena, we relied a lot on extant literature. Mid-way through the project we had three interns joining us who themselves had been through preparatory spaces. This change in the research team helped change the nature of insider/outsider negotiations, across multiple dimensions including language.

#### Conclusion

The fundamental nature of this enquiry was based on social mobility, the promise of higher education in enabling social mobility and the role of preparatory spaces. We were interested in the trajectories of learners, mentors/teachers, and other stakeholders in such spaces. Looking at trajectories and the strategies of our participants, a key insight for us was to try and understand the various types of distances covered. These distances sometimes were simply spatial - travelling to coaching centres, or universities abroad; and sometimes were structurally constrained - negotiating the distance between formal and informal for example; or were deeply experiential - language differences, online and offline spaces, distance from opportunity (for instance, not knowing the possibilities of higher education, and only that of government jobs).

We conclude this paper with what is emerging as the key insight for this in-progress study. Learners and mentors/teachers in this ecosystem of community-based preparatory spaces have engaged in the co-creation of a figured world with specific strategies shaping their practice. These strategies are informed by their conditions of being (in the larger society), the barriers they face, and the strategic negotiation opportunities that being part of communities of practice allows them.

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# Impacts of the University-Society Linking Process: The Case of the Locality 'El Valle', Ecuador

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#### Abstract

The management of university education is based on three fundamental pillars: teaching, research and university-society links. This last process emerged in the mid-19th century because of the research dynamics in developed countries and the need to interact with the environment in a way that was not limited to training, but also promoted the transfer of knowledge and technology to the socio-economic sphere. The aim of this paper is to show the results obtained from the measurement of the impact of the intervention project carried out in the local community of 'El Valle', Ecuador, on the productive associations made up mainly of women who operate under the Popular and Solidarity Economy (EPS) approach. The project was led by professors from the Salesian Polytechnic University (UPS). The techniques employed included the evaluation of deliverable and surveys of the involved members of the GAD (Autonomous Decentralized Government), teachers, community members and students. The results made it possible to evaluate the fulfillment of the proposed objectives in terms of organizational strengthening and women's empowerment, as well as the enrichment of the teaching process through the practical involvement of both teachers and students. In addition, the main difficulties of the process were identified, highlighting the lack of continuity in local policies and strategies for the consolidation of networks between local actors that promote the development of the territory and the need to improve the forms of monitoring and evaluation of projects.

Keywords: Impact Measurement, Linkage Projects, University-Society, Local Actors, Local Development

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## Introduction

The link between the university and society has its beginnings in the mid-19th century, when universities began to generate research results and the need to commercialize them arose. This extended their contribution to the process of innovation and development of society, and their scope of action included the processes of education, research and what became known as the third mission of the university: the link with society.

Since then, the methods that have supported this process have gone through various modalities, generally based on Sábato's triangle proposal, developed as the Triple Helix model (Etzkowitz & Leydesdorff, 2000), whose basis is the relationship between government, university and business.

The evolutionary process has followed a path that initially expressed a linear relationship between these agents, in which the university drove science, trying to provoke innovation through the application of research results in production, under the Triple Helix approach. Subsequently, there has been a transition towards a more dynamic relationship between these actors, moving towards the more developed forms of Triple Helix II, III and IV, in which other civil society actors are involved, and Triple Helix V, which incorporates the process of measuring impacts to evaluate the effect of this process on society, from the perspective of changes in social and economic areas (López et al, 2006; González, 2009; Chang, 2010; Aceytuno & Cáceres, 2012; Castillo et al., 2014; Corrales, 2014; CRUE, 2018; Torres, 2019; Cedeño & Rodríguez, 2020; Gutiérrez & González, 2020; Castillo, 2020; Gálvez, 2022; Padilla et al., 2023).

The transition of this process has evolved differently in developed countries than in the countries of the Latin American region, mainly due to the economic differences between the two (CEPAL, 2016; 2022). In the former, the process is characterized by the generation of development and innovation projects basically through research results transfer offices or spin-offs, whose objective is mostly linked to the creation of new companies with a strong technological component, based on the results generated by the research process in universities. In Latin America, on the other hand, this process is more strongly linked to the social sphere and, for the most part, the transfer of knowledge is derived from the training process, through the joint effort of teachers and students to try to put into practice improvements in productive and social processes in the business and local sphere (Bermeo et al., 2022; Da, Luz et al., 2016; López et al., 2006; Londoño et al., 2018; Padilla et al., 2023, Valencia and Becerra, 2023).

The references consulted in relation to the measurement of project impacts show that one of the most complete is the methodology proposed by ECLAC (Economic Commission for Latin America and the Caribbean) for measuring the impacts of projects aimed at eradicating poverty. Although it does not refer to university-based linkage projects, its proposal is of interest for this purpose. Its procedure highlights two strategies, anticipating the effects of the programme and not anticipating these effects, and the assessment of the effectiveness and efficiency of the programme with emphasis on the objectives, indicators and distribution of impacts among beneficiaries (Navarro, 2005).

Díaz and Sain (2007) present a methodology for measuring the impact of projects financed by FONTAGRO, especially in agriculture. Their proposal is interesting in terms of the integration of economic, social, political and environmental dimensions, with emphasis on

the innovation process; it coincides with ECLAC in the relevance of considering the indicators, the amount and the distribution of benefits.

On the other hand, there are other methodologies such as the one proposed by the AEF (Spanish Association of Foundations), which similarly relies on the measurement of objectives/results based on indicators but has a closer approach to the components of the project, specifically those involved (AEF, 2015). A greater attachment of impact measurement model, linked to the methodology of project management with logical framework approach, is supported by the parameters of relevance, efficiency and effectiveness (Rodríguez and Cobas, n.d.); a general methodology for measuring business projects based on various methods (Cámara de Comercio Barranquilla, n.d.); measurement of impacts in the social sphere, which goes beyond the fulfilment of objectives to measure results on a group that has been exposed to an experimental variable; complexity of this analysis given the multiplicity of factors that intervene in the transmission of knowledge to the social sphere (Albornoz et al., 2005; Valdés, n.d.).

In general, these methodologies coincide in that the measurement of the impact of a project is aimed at measuring the transformation of the object of intervention, i.e. assessing the level at which the project contributed to bringing about the expected changes to bring a diagnostic situation to a desired situation in which the problems are attenuated or disappear.

In Ecuador, management policies favour the dynamics of this process explicitly set out in the Organic Law on Higher Education (LOES, 2010). Following this policy, the Salesian Polytechnic University (UPS) each year implements linkage projects oriented to various areas (Higher Education Council, 2022). Among these, a linkage project was implemented involving the 8 productive associations that operate in the town of El Valle located in the canton of Cuenca, province of Azuay.

This project was implemented in two phases: in the first phase, after the diagnosis that resulted in the most relevant problems, a programme of actions was implemented to strengthen the business of these associations, integrating the efforts of 6 careers of the institution, the Decentralized Autonomous Government (GAD) of the parish and the Ministry of Agriculture (MAG), and in the second phase, a proposal for integrated marketing was formulated, through the creation of a direct marketing channel for the production of the 8 associations.

In the bibliography consulted, no references have been found that provide methodological details for measuring the impact of projects of this nature, only the one described by Zamora, et al., (2022), which proposes a management model for linkage projects from the university in Ecuador, which favours this aspect; therefore, the methodology used for the research emphasises in-depth analysis through the use of interviews and surveys of those involved, following the logic of qualitative research to investigate the benefits achieved by the project from different perspectives, evaluating the fulfillment of the objectives based on indicators; therefore, this study aims to answer this question: What are the impacts generated by the intervention project in the community of Valle Ecuador in relation to the proposed objectives from the perspective of the direct beneficiaries and the rest of the actors involved (members of GAD, teachers and students?

# Method

The parish of El Valle is in the southeast of the city of Cuenca, with an area of 4,305.01 hectares and a population of 24,314 inhabitants, 11,489 men and 12,825 women, with a poverty level of 63.4% (INEC, 2010). Productively, the parish mainly grows corn, beans, alfalfa, potatoes, peas and vegetables, complemented by activities such as raising chickens, guinea pigs, pigs and dairy cattle. Its geographical location is shown in Figure 1.



Figure 1: Map of the Parish 'El Valle' Source: Development and territorial planning plan for the parish of El Valle, 2020

A total of 8 agricultural production associations in the El Valle area were selected for the study. Of these, 5 operate under the EPS approach and are subscribed to the National Secretariat of Planning and Development (SENPLADES). The remaining ones are subject to the MAG; the first link to move to the EPS business form.

The type of research used was qualitative and the methodology is aligned to the case study under the participatory action-research approach, which involves the search for solutions to specific community problems, focusing on processes that guide decision-making with the participation of those involved (Bernal, 2011; Hernández-Sampieri and Mendoza, 2018).

The techniques used were:

- Survey-interview of community members and members of the parish GAD with the purpose of gathering information on the fulfillment of the project objectives, its contribution to the changes operated in the management of the productive associations and the main difficulties that in the course of the time that elapsed since the implementation of the project remain present.

- Documentary review of the project deliverables.

- Focus group with members of the productive associations, to provide feedback on the fulfillment of objectives and to identify new needs.

Career that coordinated the project and the impact assessment: Business Administration.

Participating careers: 6 (Veterinary Medicine, Environmental Engineering, Communication, Biotechnology, Administration and Accounting and Auditing).

## Results

		· · · · · · · · · · · · · · · · · · ·
General Objective	Indicator Target	Level of Impact Achieved in Terms of Transformation of Effects
Contribute to the development of capacities in the beneficiaries for the generation of alternatives that add value to the products created in the different economic- productive associations of which they are part, for the better use of market opportunities at national and international level	<ul> <li>At least 85% of those involved in the project representatives of the GAD declare a high level of satisfaction about the execution of the project.</li> <li>At least 80% of the associations declare improvements in the management of their organizations as an alternative to poverty (end of poverty; gender equality, decent work and economic growth).</li> </ul>	<ul> <li>The level of satisfaction of those involved by the GAD is expressed as an average of 60%.</li> <li>33.5% say they have obtained better results in the management of the production and marketing of their products.</li> <li>77% of the focus group participants rate their level of integration, leadership, production at a level of 3 to 5. 100% consider that if they work together, they can achieve their objectives.</li> </ul>

Table 1: Summary of Results With Respect to the Overall Project Objective

Specific Objectives	Indicator Name	Level of Impact Achieved in Terms of Solution of the Specific Problem				
Community members						
• Apply management technologies in correspondence with the particularities of the community that contribute to the development of innovative processes linked to the improvement and/or creation of new ventures.	<ul> <li>Sales revenues of the associations' products are at least 1.5% higher than 4 years ago.</li> <li>At least 80% of the associations state that they have succeeded in expanding their markets.</li> <li>At least 80% of the associations have used the attribute 'organic product' as part of their communication message.</li> <li>At least 80% of the production associations report improvements in the management of their production organizations.</li> </ul>	<ul> <li>A localized increase in sales is achieved, especially in the marketing of guinea pigs, by approximately 1%, but not in agricultural products.</li> <li>Although promotional activities have not been regularized, 100% state that in those that have been carried out, this attribute was used as a component of the brand.</li> <li>Approximately 77% state that their level of management is maintained at an acceptable level.</li> </ul>				
<ul> <li>Identify the necessary components for the creation of an umbrella brand to cover the products created in the partnership community.</li> <li>Increase the visibility and impact of the Salesian Polytechnic University at Cuenca in the improvement and social responsibility of its local environment.</li> </ul>	<ul> <li>The productive yields of these organizations have increased by at least 1% compared to 4 years ago.</li> <li>At least 80% of the associations declare that their levels of integration are higher than 4 years ago.</li> <li>At least 80% of the partners report that they have incorporated management knowledge and skills (Level 3 to 4).</li> <li>At least 80% of the partners use the biodigesters installed by the project</li> <li>At least 50% of the associations have integrated to structure a joint marketing offer.</li> <li>For "Virgen de los Milagros" association's partners:</li> <li>At least 80% of the associates have completed the project for the construction of sheds for the improvement of guinea pig breeding.</li> <li>At least 85% of those who implemented the project express that the level of quality is at a rating of between 4 and 5.</li> <li>At least 80% of the partners say that they have been able to better market the results of guinea pig production.</li> </ul>	<ul> <li>Only one of the organizations that produce, and market guinea pigs shows this increase.</li> <li>100% of the respondent's state that their level of integration remains low, especially after the pandemic.</li> <li>It is partially fulfilled that 100% declared to have improved their knowledge and skills in sales and market analysis, but not in production management.</li> <li>100% report partial use of the biodigesters, which indicates that they are not used optimally.</li> <li>It was not possible to integrate the partners to make a joint marketing offer. The representatives of the GAD declare having valued the proposal, but not implementing it because of the pandemic.</li> <li>100% of them declare the completion of the sheds for guinea pig production, which has led to improvements in the production and commercialization of guinea pigs</li> </ul>				

# Table 2: Summary of Results With Respect to the Specific Objectives of the Project (Community Members)

Specific Objectives	Indicator Name	Level of Impact Achieved in Terms of Solution of the Specific Problem
	Students	
• Contribute to the development of practical skills on the part of students.	<ul> <li>At least 80% of the student's state that the project contributed to the improvement of their learning process (satisfaction index between 4 and 5 points).</li> <li>At least 80% of the student's state that the project contributed to the implementation of the knowledge acquired on the course.</li> <li>At least 80% of the student's state that what they have learnt from the project has been useful for their current job performance.</li> </ul>	<ul> <li>57.2% express a high level of satisfaction (values of 4 and 5). 28.6% express a medium level of satisfaction (3).</li> <li>100% of the students mark at least one aspect in which the project has contributed to the development of skills.</li> <li>57.1% stated that the project was useful in their current job. 28.6% say that it was useful at a medium level (3).</li> </ul>

Table 3: Summary of Results With Respect to the Specific Objectives of the Project (Students)

Specific Objectives	Indicator Name	Level of Impact Achieved in Terms of Solution of the Specific Problem
	Teachers	
• Contribute to the improvement of the management of the teaching process with emphasis on the integration of disciplines.	<ul> <li>At least 90% of the teachers consider that their participation in the project was beneficial for the improvement of the teaching-learning process in their subject.</li> <li>At least 90% of the teachers consider that the project allowed them to develop students' skills in professional practice, teamwork and human values.</li> <li>At least 90% of the teachers consider that the project allowed them to develop didactic resources.</li> <li>At least 90% of the teachers consider that the project allowed them to develop didactic resources.</li> <li>At least 90% of the teachers consider that the project allowed them to develop didactic resources.</li> <li>At least 90% of the teachers consider that the project contributed to increasing students' knowledge/skills.</li> <li>At least 90% of the teachers consider that the project was achieved.</li> </ul>	<ul> <li>100% of the teachers consider that their participation in the project was beneficial for the improvement of the teaching-learning process in their discipline.</li> <li>100% of the teachers consider that the project allowed them to develop skills in the students in professional practice, teamwork and human values.</li> <li>100% of the teachers consider that the project allowed for the development of didactic resources.</li> <li>100% of the teachers consider that the project contributed to increasing students' knowledge/skills.</li> <li>100% of the teachers consider that the integration of disciplines in the project was achieved.</li> </ul>

Table 4: Summary of Results With Respect to the Specific Objectives of the Project (Teachers)

•	Socio-economic	٠	Feedback from association	•	The report was delivered,
	diagnosis of the		members on poverty		3 problems were
	association's members		perception, levels of		prioritised on which the
			integration, leadership and		intervention was carried
	• 7 training		management skills.		out by selecting 3 of the
	• / training	•	At least 80% of the		participating associations.
	Diadigastars		participants develop skills in:		Their partial use is
	• Diouigesters		Group work, Popular and		evident, as a support for
	• Sileds for the		Solidarity Economy		decision-making by the
	auinea nia		Approach, Management		GAD.
	management		Process, Accounting records,		
	<ul> <li>Proposal for an</li> </ul>		Implementation of	•	90% expressed having
	integrated		biodigesters, disease		developed skills to some
	marketing		health conditions		extent in relation to
	structure for	•	20 biodigastars installed Use		production management,
	agricultural	•	of at least 90% of organic		sales and market
	products produced		waste manure in the		knowledge.
	by the Valley's		production of fertilizers.		
	productive	•	Guinea pig production		
	associations.		management project		
	• Profile of the		delivered. Construction of 20		
	greenhouse project		sheds for the 'Los Milagros'		
	to produce		association for breeding		
	strawberries for		guinea pigs. Increase of at		
	the association 'El		least 5% in the quality of this		
	Despacho.		meat in terms of standard		
			weight and animal health.	•	The use of biodigesters
		•	Delivered project: Integrated		does not exceed 50%.
			structure for the		
			commercialization of		
			agricultural products		
			produced by the productive		
			Increase in the marketing of		
			products by at least 5%		
			Reduction of at least 3% of	•	100% compliance is
			transportation costs		evident
		•	Delivered profile of the	•	The project was not
			greenhouse project to		implemented
			produce strawberries to the	•	Project was not
			association El Despacho.		Tormulated
			Assessment of the idea to		
			develop the project in the		
			association.		

 Table 5: Summary Results of Project Deliverables Review. Entregables Vinculados a La

 Gestión De Las Asociaciones Productivas

<ul> <li>Teaching resources</li> <li>Pre-professional internships</li> <li>Degree projects</li> </ul>	•	<ul> <li>3 workshops for strengthening marketing content, production planning and project management</li> <li>1 case study</li> <li>1 practical exercise on project formulation and evaluation (2)</li> <li>30 students carried out their preprofessional internships</li> <li>78 students were involved in community internships in the careers involved</li> </ul>	•	100% of the teachers consider that the project allowed the development of didactic resources.
		Auditing, Biotechnology, Veterinary, Environmental Engineering, Communication) in the execution of 9 training modules, directly linked to the internship	•	The degree projects were
	•	3 graduation projects		uiseusseu
C	onc	rete actions arising for research projects	1	
		<ul> <li>The project evolved into a research project whose results were published in:</li> <li>SUSTAINABILITY 'Popular and Solidarity Economy. Policies and realities in the local context. The case of the agricultural productive associations of El Valle - Ecuador.</li> <li>CODES Comparative analysis, business modality with a popular and solidarity economy approach, rural productive associations.</li> <li>The Journal of science and research Limiting factors for the growth of rural community entrepreneurship projects in the southern sector of the canton of Cuenca.</li> <li>Book. Analysis of the supply of agroecological products in the canton of Cuenca using linear regression by the least squares method to reduce the error in production planning.</li> <li>Book chapter. Solidarity economy enterprises with productive associations in El Valle, Cuenca.</li> </ul>		

 Table 6: Summary Results of Project Deliverables Review. Deliverables Linked to the Teaching Process

## Conclusions

The findings of the study are in line with the trend of the type of linkage project existing in the Latin American region, in which the transfer of knowledge to society is privileged as an extension of the teaching process and not as the placing of new research results in the sphere of production, however, the results contributed to making this process visible from the publications generated in journals, books and scientific events, at the same time strengthening the image of the institution from the perspective of its contribution to the social economic environment.

On the other hand, the critical analysis shows that the level of satisfaction achieved with the project is higher in the case of the teachers and students than in the case of the community members, even though they feel satisfied with the intervention from the training point of view, it has not been possible in general to put the acquired knowledge into practice, this was more evident in the case where the project added the delivery of physical infrastructure with the biodigesters and the sheds for the breeding of guinea pigs.

The general objective is partially fulfilled given that from 85% of the level of expectations with respect to the satisfaction of the beneficiaries, approximately 60% is reached, this implies assessing that, although it has contributed to the achievement of SDG (Sustainable Development Goals) such as the end of poverty, gender equality, decent work and economic growth, the effort made is still not enough, however, it constitutes an important basis for continuing to work on the solution of the problems that were selected in this project.

These results are influenced by several factors. Among them are the lack of concrete policies at the territorial level, the variation of strategies according to political interests, the lack of articulation among decision-makers at the local level, which leads to atomization and repetition of actions, unequal empowerment among the members of the associations, among others.

Similarly, the specific objectives linked to the development of skills that strengthen the management processes of these associations are partially fulfilled, but not in the case of the association "Virgen de los Milagros", dedicated basically to the breeding and commercialisation of guinea pigs, where significant changes are evident, and even though the negative effects of the pandemic are still present, we believe that it is possible to recover them and move forward in this process in a positive way.

The analysis carried out shows the need for improvement with regard to the monitoring of the project, not only on the part of the university but also on the part of the territorial actors, especially the parish GAD, even though their point of view is that the pandemic had a lot to do with the standardisation of the productive results and their commercialisation, the insufficiency in the strategic planning of the locality and the formulation of policies that achieve multi-channel relations constituted an obstacle, in fact other objectives were prioritised and due continuity was not given to those set out in the project.

About the academic dimension, the objectives are considered to have been met, both from the perspective of the students, who express acceptable levels of satisfaction with the implementation of the knowledge and skills developed in classes, and from the teachers' perspective, who were able to develop teaching resources and enrich the contents of the programmes.

Two of the most relevant achievements of this project can be highlighted as follows:

- 1. Integration of several careers in the implementation of the project.
- 2. Linking with the research process.

The limitations of the study are associated with the sample size of the population to assess the impacts generated by the project, for future evaluations it will be necessary to expand it, to compare more opinions and points of view. Over time, the leaders of the associations and even the actors who participated in the project change and this has an unfavourable influence on the measurement of impacts.

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#### Framework for Entrepreneurial Education: Integrating Experiential and Transformative Learning in Vocational Institutions

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#### Abstract

Entrepreneurial education is essential for promoting an entrepreneurial culture, stimulating socio-economic development, and fostering innovation in all countries. In the academic literature, experiential learning, which integrates experience into educational processes, is considered an effective approach to developing entrepreneurial skills. Transformative learning, on the other hand, focuses on changing students' thinking structures and beliefs by providing new reference systems. This is essential to stimulate new perspectives on entrepreneurship and to prepare future professionals for a highly volatile scenario. Despite the amount of research on entrepreneurial education, its application in vocational education is still under-researched and many studies are not based on consolidated learning theories. In view of this, the main objective of this research is to develop a support structure for entrepreneurial education in the context of Brazilian public vocational and technological education. The research adopted the Educational Design Research method, characterized by a theoretical and contextual orientation, focused on problem solving. The data collection techniques promoted co-creation among the participants. As a result, the research proposes a four-dimensional structure that integrates a shared vision of entrepreneurship, integrated educational practices, internal and external relationships, and related support processes.

Keywords: Entrepreneurial Education, Experiential Learning, Transformative Learning



# Introduction

Entrepreneurship is widely recognized as a driver of socio-economic development and a catalyst for innovation. This scenario leads to a growing appreciation of entrepreneurship in the field of education. Entrepreneurial education (EE) has become a strategy to strengthen educational reforms (Wang et al., 2022) and plays a key role in developing the entrepreneurial skills of future professionals and leaders (Nayak et al., 2024). It also contributes to reducing unemployment (Shwedeh et al., 2023), increasing employability, professional development, and strengthening citizenship (Rodrigues, 2023).

Defined as a set of programs, courses, and processes aimed at developing entrepreneurial knowledge, skills and attitudes (Hahn et al., 2017), entrepreneurial education currently covers areas beyond business education, including vocational and technical education. This context includes the Brazilian Federal Institutes of Education, Science, and Technology, also known as Federal Institutes of Education (IFs), a federal public network present in all Brazilian states with technical and higher education courses, whose objectives include promoting entrepreneurship, innovation, and income generation.

The scientific literature points out that learning in entrepreneurship is more effective when it is related to real situations, promoting the student's protagonist action and critical reflection in the generation of knowledge (Nabi et al., 2017; Pittaway & Cope, 2007; Warhuus et al., 2018). In this context, experiential learning (EL) (Kolb, 1984, 2015), which focuses on the transformation of knowledge through experience, gains importance through the integration of this experience in entrepreneurial education processes (Shwedeh et al., 2023; Bell & Bell, 2020; Chhabra et al., 2021; Rodrigues, 2023; Preedy et al., 2020).

However, despite the advances in research, entrepreneurial education is still a disciplinary field in consolidation, especially in terms of pedagogy and the integrated incorporation of entrepreneurship into curricula (Rodrigues, 2023). In a connected and knowledge-intensive world, entrepreneurship curricula are slowly updated, making it difficult to train students to deal with uncertainty, ambiguity, and volatility (Kononiuk et al., 2021). In addition, future (and current) entrepreneurs need to be able to think critically and envision ways of doing business that are consistent with sustainable development.

Entrepreneurial education should foster multiple perspectives on entrepreneurship, challenge entrenched ideas and stereotypes, and promote new views on the act of entrepreneurship (Higgins et al., 2019; Kakouris, 2015). In this sense, transformative learning (TL) (Mezirow, 1981) emphasizes problematization in education and encourages critical reflection on reality and possibilities for action. In TL, structures of meaning are transformed through reflection, questioning assumptions, and assessing whether existing belief systems are still valid and functional (Mezirow, 1981).

Constructivist EE methods based on EL and TL require specific pedagogical processes (Bell & Bell, 2020), educator training (Motta & Galina, 2023), leadership support, availability of institutional resources, and appropriate learning environments (Christensen et al., 2023). Moreover, beyond the didactic-pedagogical level, EE needs to consider ontological and philosophical questions about entrepreneurship, the role of its actors, and education in this context (Fayolle, 2013). This gap is reflected in the absence of models or frameworks that promote an integrated approach, including educational practices and support processes.

Therefore, this research proposes to investigate the following problem: how to develop a support structure for entrepreneurial education in the context of Brazilian public vocational and technical education – especially in the aforementioned IFs – based on the theories of experiential and transformative learning. The objective of this research is to present the first two steps taken to build this framework.

#### **Entrepreneurial Education and Learning Theories**

The scenario in which EE takes place calls for new educational paradigms aimed at active, self-directed and self-regulated educational processes by students (Preedy et al., 2020). Despite the growing volume of publications, EE is still considered to lack a theoretical foundation, especially when it comes to deepening the educational theories applied to the field (Fayolle, 2013; Kumar et al., 2020). In the literature review of this research, two learning theories were identified that can be used as a reference for structuring an EE framework: Experiential Learning (EL) and Mezirow's (1981) Transformative Learning (TL).

Experiential Learning is defined as a process by which knowledge is created through the transformation of experience (Kolb, 1984, p. 41), i.e., a process of meaning-making that involves significant experiences that serve as a source of learning at various levels (Wilson & Beard, 2013). David Allen Kolb, one of the main formulators of experiential learning theory (ELT), structured the Experiential Learning Cycle (ELC) into four adaptive processes: (i) **concrete experience** (CE), an experienced activity, situation, or event that serves as a basis for reflection; (ii) **reflective observation** (RO), conscious reflection on the experience with the goal of understanding what happened, its implications, and meanings; (iii) **abstract conceptualization** (AC), construction of concepts and theories, integrating the acquired knowledge with existing knowledge to develop a new understanding; and (iv) active experimentation (AE), application of the new knowledge in practice, testing its consequences, and guiding new experiences.



The second theory that guides this research is Mezirow's Transformative Learning (1981, p. 190), which he defines as a process of using a previous interpretation to construct a new or revised interpretation of the meaning of the experience in order to guide future action. This theory emphasizes the importance of problematization in education, promoting reflection and critical thinking to make individuals aware of their reality and their options for action. In TL, structures of meaning are transformed through reflection, which involves critiquing the assumptions that determine whether the existing belief system remains valid and functional (Mezirow, 1981). The TL approach is characterized not by the amount of information assimilated, but by the profound transformations it provokes in students (Arpiainen & Kurczewska, 2017; Bell & Bell, 2020; Kakouris, 2015).

In summary, although the two theories have different conceptions, they both emphasize experience and reflection in the learning process. EL focuses on practical application and individual learning styles, and TL emphasizes the critical transformation of learners' views and beliefs. Learning by doing and critical learning are fundamental to educating future leaders and entrepreneurs.

# Method

This research adopts the Educational Design Research (EDR) method, which is developed in three macro stages (McKenney & Reeves, 2018):

i) Analysis and exploration: a scientific basis is sought to understand the problem and analyze the phenomenon in question; empirically, this includes the identification and diagnosis of the problem, which allows the development of preliminary requirements and long-term objectives. For this research, an integrative review of the literature on EL interrelated with EE was carried out, consolidating the analysis of 74 peer-reviewed articles. This stage was fundamental in providing the theoretical requirements for the framework. The **second data collection technique**, **documentary analysis**, considered Brazilian laws and resolutions related to Brazilian vocational education and was important in identifying existing assumptions. Also at this stage, 21 **interviews were conducted with educators** from nine IFs campuses in the state of Santa Catarina (Brazil). These interactions were important to get an overview of teaching practices, existing challenges, and possible requirements for the framework.

ii) Design and construction: based on the available knowledge and its interrelations, solutions are mapped out, articulating their theoretical and practical foundations; this allows the structure to be shared and critiqued.

iii) Evaluation and reflection: dedicated to the formulation of conclusions, restructuring or adaptation of the intervention proposal; reflection also aims at a broader theoretical understanding of the issue under study.

This article focuses on the results of the first two macro steps, as the last step is still in progress. The analysis of data from documents and interviews followed the guidelines of Braun and Clarke (2019): a) familiarization with the data, b) coding, c) identification of themes, d) review of potential themes, e) definition and naming of themes, and f) preparation of the final report. For the framework, analysis matrices were created to triangulate the data by comparing the literature, documentary analysis, and interview findings. This allowed the elements of the framework to be structured and presented in the results.

#### **Results and Discussion**

Before presenting the results of this research, it is important to briefly explain the organization studied.

The IFs are Brazilian public, multi-campus and multidisciplinary institutions that work in educational modalities that integrate science and technology, with the aim of training professionals for the world of work. These institutions are part of the Federal Network for Professional, Scientific and Technological Education (Federal Brazilian Law No. 11.892) and offer technical courses (secondary level), undergraduate courses (technologist, bachelor's, and teaching degrees) and graduate courses. In international terms, the educational offer of the IFs corresponds to the Technical and Vocational Education and Training (TVET) segment. Entrepreneurship is explicitly mentioned as one of the institutional purposes of the IFs (Federal Brazilian Law No. 11.892), with the support of educational processes that promote the generation of work, income, and citizen emancipation, contributing to local and regional socio-economic development.

According to Stadler (2017), the IFs face political, institutional, and methodological challenges in implementing EE. The author argues that an integrated approach to the institutional context is needed, taking into account the objectives of vocational and technical education and the need to strengthen the capacity of these institutions to engage in entrepreneurship and local development.

The results of the first two stages of the EDR are presented below, with the final presentation of the framework created, which was designed for technical courses for students at secondary school level and for undergraduate degrees (technologist, and bachelor's degrees).

#### Analysis and Exploration

In order to develop a framework to support the structuring of EE, in this first stage, the theoretical basis was defined and a situational diagnosis was made to understand the reality of practices, requirements and outcomes sought with the framework.

In relation to the **theoretical basis**, the empirical articles analysed identified that experience in EE is a source of learning that actively involves the student, is contextualized (Higgins & Galloway, 2014; Pittaway & Cope, 2007; Preedy et al., 2020), generates critical reflections (Bell & Bell, 2020; Kakouris, 2015; Preedy et al., 2020), and can take place in formal, informal and non-formal environments (Shwedeh et al., 2023). The experiential activities (Table 1) designed by the teachers include a diversity of practices aimed not only at creating new businesses, but also at developing solutions or projects for existing organizations.

These activities integrate curricular and extrcurricular opportunities. Elective activities are considered fundamental because they encourage students to find their own paths, promote interdisciplinarity (Nayak et al., 2024), collaboration among students, and interaction with the entrepreneurial ecosystem (Alam et al., 2023; Solan & Shtub, 2023). Among the methods, active approaches predominate (Bell & Bell, 2020), especially project-based learning and problem-based learning (Morselli & Orzes, 2023).

An important point in this analysis was the interaction with the external context. The relationship between the educational institution and the productive sectors is essential for the

teaching-learning process, innovation, and meeting the needs of society. In the studies analyzed, this interaction occurs through the participation of local entrepreneurs, external professionals or members of the community in educational activities and in the development of research and extension projects with the productive sectors and communities. In experiential activities, it was found that external actors play different roles in the provision of EE, acting as mentors (Chhabra et al., 2021), lecturers, judges in competitions, coaches (Preedy et al., 2020), and supporters of activities (Pittaway & Cope, 2007; Ramsgaard & Christensen, 2018). Many of these activities take place outside of the educational environment, in the organizations' or communities' own spaces.

In addition to these specific needs, which are summarized in Table 1, the theoretical review also identified possible existing models and frameworks, two of which were used as inspiration. The first is the model of Fayolle (2013), which considers two levels: i) the philosophical, with an understanding of the meaning of entrepreneurship and the role of education and the participants, which is fundamental to guide the practice; and ii) the didactic-pedagogical, which specifies the audience, content, methods, and evaluation. The second model was the UNESCO document *Entrepreneurial Learning for TVET Institutions: A Practical Guide* (Lindner, 2020).

Table 1 summarizes the main results of the theoretical analysis.

#### Table 1: EL and TL References for the Framework

#### **Experiential Activities**

Activities designed by educators to promote the teaching and learning of entrepreneurship. The literature review identified the following categories:

- 1) Integrated professional learning (Padilla-Angulo et al., 2021);
- 2) Competitions and business games (Pittaway & Cope, 2017);
- 3) Creating real businesses (Bell & Bell, 2018);
- 4) Planning business plans and models (Williams, 2015);
- 5) Developing projects and activities (Ramsgaard & Christensen, 2018);
- 6) Simulating business plans and models (Padilla-Angulo et al., 2021);
- 7) Other (activities that do not fit into the previous categories but have an experiential basis) (Preedy et al., 2020).

#### Factors for implementing EL in EE

- Constructive alignment between content, student profile, and methods (Bell & Liu, 2019);
- Preparation of teachers and students for a constructivist approach; (Bell & Bell, 2020; Bell & Liu, 2019);
- Offering elective curricular (Van Der Lingen et al., 2020) and extracurricular activities (Padilla-Ângulo et al., 2021; Preedy et al., 2020);
- Application of active methods (Rodrigues, 2023), such as challenge-based learning, peer learning, and project-based learning;
- Integration of practice with theoretical knowledge and objectives (Bell & Bell, 2020; Chhabra et al., 2021);
- Stimulation of critical reflection by students (Bell & Bell, 2020);
- Assessment of learning with the integration of reflective activities (Warhuus et al., 2018);
- Integration with the external context for practicing activities and innovation (Alam et al., 2023), with the possibility of external actors participating in educational practices (Chhabra et al., 2021; Preedy et al., 2020);
- Personal development of educators for EE (Rodrigues, 2023).

# Challenges

- Resistance from leaders, teachers, and students to adopting constructivist-based methods (Bell & Liu, 2019; Motta & Galina, 2023);
- Lack of availability of time and technological and financial resources (Motta & Galina, 2023);
- Difficulty in continuing experiential activities when teachers are changed (Simmons, 2021).

Source: Prepared by the authors based on the literature reviewed.

With regard to the situational diagnosis, the **documentary analysis** considered Brazilian laws and resolutions related to Brazilian TVET. This inclusion was important to identify existing guidelines in terms of educational practices. The main pedagogical principles identified were: i) the need for integration with society, ii) the adoption of active methodologies, and iii) the integration of teaching, research, and extension, with a view to the comprehensive training of students and not the fragmentation of knowledge.

From the interviews with 21 educators, one of the strengths identified was the high capillarity of the IFs, as they are located throughout Brazil, which allows them to establish direct connections with the entrepreneurship and innovation ecosystem and the community. The diversity of training areas for professionals is also an advantage, considering the multidimensional nature of entrepreneurship in different professional backgrounds.

Another positive aspect identified, although not predominant in all interactions, was the implementation of interdisciplinary experiential activities with a practical focus. Related research and extension projects were also mentioned as important practices, as they subsidize teaching activities, promote innovation, and provide space for students to develop entrepreneurial skills. However, there are limitations related to the implementation of EE that need to be addressed in the framework.

The **interviews** pointed to a lack of cohesion and discussion about the meaning of entrepreneurship in the institution, indicating a lack of clear strategic direction and specific policies. This deficiency affects the interdisciplinary approach in the curricula of the courses, indicating a lack at the philosophical level of EE (Fayolle, 2013).

In educational practice, some curricular and extracurricular initiatives are effective, but they are not fully integrated. Such initiatives depend on the individual motivation of educators, as formal support from the institution is insufficient (Stadler, 2017). With regard to experiential educational activities, greater integration is needed to ensure the interdisciplinarity of the subject in courses and the focus on authentic experiences, including teaching, research, and extension, in order to align the educational offer with the needs of students and the local and regional context. The stages of reflection and procedural assessment of learning could also be better structured to promote EL and TL.

The support structure for students wishing to develop autonomous entrepreneurial activities varies from campus to campus. There is a limited supply of learning environments that provide real entrepreneurship practice.

In terms of institutional support, limited financial resources were highlighted as a challenge that impacts on infrastructure and staffing. In addition, there are difficulties in internal processes, such as the establishment of partnerships and the continuity of educational practices already developed in processes of teacher replacement.

#### Design and Construction Stage

The first version of the EE Framework was structured based on the triangulation of data from the literature, document analysis, and interviews (Figure 2).



Figure 2: Structuring the Design and Construction Stage Source: Prepared by the authors

In terms of learning theories, the first stage of the Educational Design Research showed that EL and TL are compatible with the organizational characteristics of the IFs, which are based on the integration of theoretical and practical knowledge, work as an educational principle, and emancipatory training. In EL, there is a bridge between experience, the world of work, and the educational context, facilitating the development of essential skills for adaptation, problems-solving, and innovation. TL, on the other hand, emphasizes the development of the individual's critical and reflective capacity to interpret the world, making them aware of their reality and their possibilities for action (Mezirow, 1981). This theory was included in the framework because of its emphasis on critical reflection and the need for new perspectives on the entrepreneurial profile and action in complex scenarios. From the perspective of the IFs, vocational and technical education is seen as a tool for building citizenship and social transformation (Federal Brazilian Law No. 11.892).

# Structure of the Framework

Based on the identification of needs, premises, and challenges, the framework was structured into four dimensions that represent broad axes of action with the same focus and interrelated

characteristics and elements: (i) Shared Vision; (ii) Educational Practice; (iii) Relational; and (iv) Institutional Support.

The **Shared Vision** was inspired by Fayolle (2013), who discusses the philosophical level of EE, and Lindner's work (2020), which guides the creation of a value proposition for EE. This dimension integrates the internal meanings of entrepreneurship, the role of education and its actors, elements identified as lacking in the empirical field. This perspective is crucial for the direction and organization of education. It includes guidelines for the inclusion of EE in institutional plans and the collective co-creation of the meanings of entrepreneurship.

The **Educational Practice** represents the didactic level explored in Fayolle's models (2013) and includes teaching, research, and extension activities, both curricular (elective or mandatory) and extracurricular. This dimension is guided by a systemic and interdisciplinary vision that aims to develop students' autonomy. Its theoretical basis includes EL, TL, interdisciplinarity, transdisciplinarity, and active methodologies (Luchesi et al., 2022). The guidelines for this dimension focus on teaching methods, learning environments and the inclusion of entrepreneurship in the creation and updating of courses, with the aim of creating pedagogical pathways.

The **Relational** dimension encompasses the relationships established internally among faculty, educational technicians, managers, and students, as well as interactions with the external environment. It aims to ensure that the pedagogical approach is based on a shared understanding of the context and involves the active participation of the actors (Hunter & Lean, 2018). Actions include knowledge sharing between educators and between campuses, for interdisciplinary entrepreneurship and interaction with the entrepreneurship and innovation ecosystem, students and society.

The **Institutional Support** addresses financial, material, and support resources, as well as educator training and the mechanisms needed to develop EE. A constructivist approach requires resources, time to plan and implement activities, and ongoing training for educators (Bell & Liu, 2019; Motta & Galina, 2023).

Figure 3 illustrates the proposed framework. In the center are the four dimensions, which are interrelated. In the gray area, the words "authentic experiences", "protagonism", and "transformation" represent the main theoretical orientations of the framework (Kolb, 1984; Mezirow, 1981). The institutional context is represented by the outermost arc and the icons representing the actors (entrepreneurs, public and private actors, graduates, civil society organizations, and economic, social, environmental, and cultural factors).



#### FRAMEWORK 3E - EXPERIENTIAL AND TRANSFORMATIVE ENTREPRENEURIAL EDUCATION

Figure 3: Framework 3E Source: Prepared by the authors (2024)

Each dimension contains inducing guidelines, which provide guidance for action. For each guideline, descriptors were defined that specify possible actions based on empirical mapping and EE requirements. Premises were also defined, which are the explicit knowledge present in institutional documents, as well as the actors responsible for implementing each guideline. However, these elements are currently being evaluated and reflected upon by experts from the IFs (the third macro-stage of the EDR.

# Conclusion

This research has elucidated the initial stages of building a framework to support entrepreneurial education in the context of Brazilian vocational and technological education, with a focus on students, supported by authentic experiences, and with an emphasis on transformative education. By using experiential and transformative learning theories as theoretical references, the research contributes to reducing the gap between education and entrepreneurship.

The chosen method – Educational Design Research – proved to be suitable for theoretically and contextually oriented research, favoring data triangulation and, above all, iterativity between phases.

Although the framework is still being evaluated in the context of a doctorate, which is considered a limitation, it is believed that its structuring in interrelated dimensions and guidelines can guide educational managers and educators in planning educational, administrative, and management processes, resulting in more effective impacts for students and society.

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# Early Childhood Political Education: The Role of Media in Shaping Democratic Awareness

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#### Abstract

Democracy thrives on participation (Endeward et al., 2016). The active engagement of citizens in society depends on their political understanding, which requires both knowledge and political awareness. This awareness is cultivated from childhood (Marci-Boehncke et al., 2023), as "childhood is not a politics-free zone, and children's lives are by no means apolitical" (Belwe, 2005). Children enter the school system with prior exposure to political education, but where does this early political understanding originate, and what sociopolitical knowledge do they possess? The interdisciplinary research project PoJoMeC at TU Dortmund, funded by the Federal Agency for Civic Education, investigates these questions. The project emphasizes the relationship between media and world understanding (Goll et al., 2023), as media act as "mediators of the world and generators of worldviews, shaping our perception of reality" (Rath, 2014). This is particularly significant in the context of politics. Mass media and the communication about them plays a critical role in early childhood education. This is also reflected in the educational principles for children aged 0 to 10 in North Rhine-Westphalia by highlighting media as one of the crucial "influences in the constantly evolving world of children" (MFKJKS, 2016). This paper presents the findings from the first phase of the PoJoMeC research project, focusing on how socio-political knowledge is acquired through media, family, and early childhood education institutions such as kindergartens. The study also examines the role of daycare centers as the first non-family institution providing democratic experiences for children (vbw 2020; BMFSFJ, 2020).

Keywords: Media Literacy, Political Literacy, Early Childhood Education

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# Introduction

The continued viablitity of democracy depends on active participation of its citizens (Endeward et al., 2016). Given that democracy is not a static entity but rather a dynamic system undergoing constant evolution (Kenner & Lange, 2022), it is imperative to ensure its continued existence (Massing, 2020). The efficacy of a democracy is reliant upon the informed participation of its citizens (Stark et al., 2022). However, it is important to recognize that individuals do not come into this world as inherently political beings (Negt, 2010). Rather, the capacity for democratic engagement must be cultivated through learning (KMK, 2012; Fischer & Reinhardt, 2022). It is therefore of the utmost importance that children are involved from an early age, given that "childhood is not a politics-free environment, and children's lives are not immune to political influences" (Belwe, 2005, p. 2). Children absorb the language used to discuss political and social issues and express their views on these matters (Abendschön, 2022). Nevertheless, children have long been perceived by society and politics as "apolitical beings" (Husmann, 2020), who only passively participate in life and are neither capable of acting nor social actors in our society (Butschi & Hedderich, 2021). However, children are just as affected by political change as adults. This indicates that their political socialization does not only begin in adolescence or adulthood (Blöcker, 2002), as has been traditionally assumed, but rather, it already begins in early childhood (Goll, 2022; Marci-Boehncke et al., 2022). Research findings demonstrate that children as young as five years of age possess varying degrees of political literacy. This suggests that they are already capable of perceiving social issues and developing political concepts (Goll, 2022). These political concepts are closely linked to media education, among other factors. As Endeward, Köberer and Schattenschneider (2016) note, media education, media literacy, and political and civic literacy are inextricably linked, given the pervasive role of the media in the dissemination of political information. Media expand our understanding of the world, influence the way we communicate and play a role in shaping our worldviews, as they are so-called "worldview generators" (Rath, 2000; Körberer, 2022). Nowadays, there are countless ways to access information, with (digital) media exerting a particularly pervasive influence. However, the question remains: where do children gain their early political understanding, and what socio-political knowledge do they possess? These are the fundamental inquiries guiding the interdisciplinary research project, "Politics, Journalism, Media - Competencies of Children of Preschool and Elementary School Age" (PoJoMeC), which is being conducted at TU Dortmund University, with funding from the German Federal Agency for Civic Education (bpb).

The research project is centered on the examination of the political knowledge of young children, with a particular emphasis on the period preceding their entry into elementary school. Of particular interest is the question of how this knowledge is shaped and acquired through the influence of media. Of particular interest is the question of how this knowledge is shaped and acquired through the influence of the media. In this context, the following article presents the findings of the initial project period (2022-2024). The article begins by outlining the current state of research in order to contextualize the study within the scientific and social frameworks pertinent to early childhood civic education. It not only considers the family as a primary source of socialization but also examines the role of daycare centers as the initial non-family environment in which children encounter democratic values and political education.

#### State of Research on Media's Role in Early Democratic Socialization

The social attitude towards the "apolitical" child underwent a significant transformation towards the end of the 20th century (Butschi & Hedderich, 2021). This shift has led to a recognition of children as active members of our society, capable of influencing and shaping their environment (Weise, 2021). Furthermore, it has resulted in educational institutions being held accountable for promoting democratic values and practices. In accordance with the guidelines set by the Standing Conference of the Ministers of Education and Cultural Affairs (KMK), educational institutions are required to introduce students to the fundamental principles of democratic governance and social order at an early age (KMK, 2018). Moreover, the federal states have already incorporated education towards a democratic attitude as a binding educational objective within the curricula of elementary school (vbw, 2020). It is not only political education that is of consequence here; political education is a constitutional matter and is integrated into all subjects on an interdisciplinary basis. This is also the case with regard to German classes. In the context of German classes, students are taught to become responsible individuals and learn about democratic values. Furthermore, the curriculum includes an emphasis on human rights education, political education, and education for a digital and sustainable world. Democratic and political education is facilitated through the utilization of diverse textual resources and discourse, encompassing both conventional and digital/social media platforms (MSB NRW, 2021).

This approach is consistent with the principles for early childhood education in North Rhine-Westphalia (NRW), which place an emphasis on the role of both analogue and digital media in the teaching of democratic values to children aged between 0 and 10 years old. The educational guidelines highlight the importance of instilling in children an understanding of democratic structures and practices at an early age, coupled with engagement with democratic and social ways of life. This approach is believed to foster the development of responsible, active and critical thinking skills in children, which are essential for their future growth and well-being. This also affords them the opportunity to gain insight into themselves and others, develop a sense of self and identity, and comprehend that they can and should assert their rights while respecting the rights of others. This understanding serves as the foundation for democratic understanding and social cohesion (MFKJKS, 2016).

Furthermore, the preschool education plans of the federal states posit that daycare centers should already be places of democratic experience (MFKJKS, 2016). Consequently, the role of media in the definition proposed by Pross (1972) should not be underestimated. In this context, the term "media" is not understood in the narrow sense of mass media, but rather encompasses four distinct categories. These include (1) primary media, which are characterised by verbal communication, gestures and facial expressions. Subsequently, there are (2) the secondary media, which employ technology (such as the use of a pen and paper) by the producers, and (3) the tertiary media, which include radio and television, for example (Pross, 1972). Furthermore, the category of digital technologies encompasses (4) the quaternary media, including computers, tablets, and smartphones, which necessitate an internet connection (Dittmar, 2009).

In addition to these technical aspects of media, it is also necessary to consider the cultural dimension. In this context, the work of Heinz Bonfadelli (2002) is particularly relevant. In light of his findings, our research project is grounded in the concept of media, which has been developed based on his work. Accordingly, we view media as instruments of mass communication that can be utilized to effectively convey messages to a large audience.

Moreover, media serve as information channels through which news and information are distributed, exerting an influence on society and thus acting as significant transmitters of knowledge. Additionally, media also function as journalistic institutions in which established organizations engage in professional journalism, thereby also playing an important role in society. This comprehensive understanding of media enables us to look beyond the technical aspects and view their role in society from a cultural perspective.

In light of these considerations, we sought to examine, from the perspective of German/media education, the extent to which media exert an influence on children's political knowledge acquisition. To gain a deeper understanding of this complex issue, it is essential to move beyond the mere classification of media types and consider their social function. In order to examine the impact of the social environment on human development, we have drawn on Bronfenbrenner's (1979) ecosystemic model, which divides the social environment into different levels: the micro, meso, and macro levels. The exo level has been excluded from this model on the basis that the media representing this level now permeate every area of life and exert a direct impact on even the narrowest areas of a child's world. Bronfenbrenner argues that all levels of life are influenced by the respective environment, and that it is the social factors that determine our ways of thinking and feeling (Epp, 2018). In our analysis, we have therefore focused on the levels mentioned above. The micro level pertains to direct interaction within the child's immediate environment, including familial relationships and interactions with close caregivers such as grandparents or siblings. The meso level represents connections between micro level environments, such as the relationship between family and daycare center. The macro level reflects broader cultural and societal contexts, including media and social norms.

The following chapter will demonstrate the extent to which media contribute to children's knowledge acquisition within the primary family and non-family socialization instances. For this purpose, a total of 26 interviews with children aged four to six years will be evaluated.

# Findings on Early Political Socialization and Media's Role in Knowledge Acquisition

The PoJoMeC research and development project at TU Dortmund University, which is jointly supported by the departments of didactics of social and political science, journalism studies, and German/media education, brings together the interdisciplinary expertise of the respective departments in joint research on primary political socialization with a special focus on journalism and media. The project is funded by the Federal Agency for Civic Education and initiated in November 2021 with a kick-off conference. The initial survey phase began in January 2023 and concluded in October of the same year. During this period, a total of 53 children from eight different daycare centers were interviewed—27 girls and 26 boys between the ages of three and five. Following this initial phase, the interviews were reviewed and a total of 23 were selected for further discussion. The selection of these interviews was based on the quality of the responses and the insights they provided. The first phase of the survey focused on preschool children and, in particular, on the information they obtain through the media. Given the focus on children's identity formation and the development of their values, it was also important to include their perspectives on politics, journalism, and the media.

The research design was based on qualitative interviews conducted on an impulse basis. The interview guide, which was developed by all three disciplines, was divided into four key modules. The first module investigated the concept of majority voting, while the second

module examined the consumption of news and media content, as well as the means by which children obtain information. The third module addressed children's comprehension of the role of journalists in society, whereas the fourth module focused on media usage practices and examined the rules for engagement with media, as well as how children learn through media. To elicit the most candid responses, a diverse array of visual prompts, including images and videos, was employed to stimulate ideas from the children. Subsequently, the results were subjected to analysis using MAXQDA and Kuckartz and Rädiker's (2022) qualitative content analysis method.

From the field of German and Media Studies, primary media were examined first. The analysis of the interviews revealed that conversations with parents, siblings and friends constitute an important source of information for the majority of children. Upon inquiry regarding the source of their knowledge, the majority of children indicated that they had acquired it from their parents. A notable recurring theme was the Ukraine conflict, which the children had learned about through conversations with family members. Interestingly, those who stated that they had heard about it from a family member often identified their father as the source. When asked how they would obtain further information on a topic if they desired to do so, the children responded that they would inquire with their parents.



Figure 1: Interview Excerpt Martin, 5 Years Old

Additionally, children gain insight into environmental matters such as waste and pollution through discourse. For example, the father of five-year-old Jana elucidated the significance of refraining from littering during a stroll, while Carla (also five years of age) acquired insight into waste from her sister, who had observed pertinent news on television at their grandmother's residence. Friends at school constituted another prevalent source of knowledge, as evidenced by the example quote below. Evidently, communication at the micro-level serves as a pivotal conduit for knowledge acquisition among children.

I: What, for example? What are you talking about?
A: For example, that um -- if you throw a banana peel into the dirt now, it can sink into the ground here for a few days.
I: Okay.
A: And that you don't just throw garbage away. For example, it's better to buy tomatoes completely free or in a bag. (wAnja5\_4, pos. 78-83)

Figure 2: Interview Excerpt Anja, 4 Years Old

The results concerning the role of secondary media, including books, magazines, and newspapers, in children's knowledge acquisition were rather disheartening. Fewer than 50% of the children were even familiar with newspapers. Only two respondents indicated that books were a source of information. For instance, Nina stated that newspapers are intended for adults, whereas books are designed for children. Three children perceived newspapers as mere advertising brochures for toys or food, as exemplified by Jane's quote.

I: Ah, you also have a newspaper at home.J: Yes, and I always look there to see what delicious food is there (wJane5\_13).

Figure 3: Interview Excerpt From Jane, 5 Years Old

Nevertheless, some children associated newspapers with factual information. Three children identified newspapers as a source of information for their grandparents. Rabea, for instance, noted that her grandparents read newspapers, whereas at home, newspapers are only used for peeling potatoes. However, Anja stated that her father is employed by a newspaper, yet the publication is used primarily at home for the purpose of arts and crafts. It is noteworthy that two children associated newspapers with the fictional journalist Karla Kolumna, a character from a German children's television program. This observation illustrates the impact of children's series on knowledge acquisition. This connection leads us to tertiary media.

The findings concerning tertiary media indicate that over two-thirds (65%) of the children surveyed reported that they obtain information from television. This makes tertiary media, particularly television, the most significant source of (political) knowledge acquisition for children. Political topics that are currently of interest to the children include environmental issues, the war in Ukraine, and the recent earthquake in Turkey, as Ahmet mentioned.

A: Yes, my baba (Turkish for dad) watches haber (news) in the evening.
I: Ah, does your dad watch Turkish news?
A: Yes.
I: And do you know what the news is about?
A: Um, about the things right now.
I: You mean what's happening right now...
A: Yes, what's happening in Türkiye. Also accidents. (mAhmet6\_53 (93ff.)

Figure 4: Interview Excerpt From Ahmet, 6 Years Old

Additionally, a considerable number of children express interest in educational programs that encompass a variety of subjects, including animal-related topics.

The content analyses of the interviews also indicated that fictional series, such as "Paw Patrol", play a significant role in children's comprehension of civic responsibilities. Approximately 73% of the young participants associated the role of a mayor with the television series "Paw Patrol", where they observed that mayors assign responsibilities or make important decisions—a concept that some could relate to real-life roles.

Further children's programs, including "Logo", "Checker Tobi", and "Die Sendung mit der Maus", were also identified as valuable sources of learning. For example, Rabea stated that she had acquired knowledge about the distinction between beneficial and detrimental bacteria from "Checker Tobi", while Lea said that "Die Sendung mit der Maus" had taught her the process of popcorn production. Anja described Woozle Goozle as an engaging method for acquiring new knowledge.

Furthermore, it was interesting to observe that meteorological information is also a subject of interest for children, who rely on television or car radio to ascertain appropriate clothing for the weather. In this regard, the interviews revealed that children perceive news from both radio and television as a source of intriguing information on fires, criminals, storms, accidents, and even international cuisines.

However, some children initially associated the term "news" with messages sent via WhatsApp or letters, indicating a lack of consensus regarding the definition of the term. In light of these insights, an analysis of quaternary media will be presented. The analysis confirmed the findings of previous studies indicating that even the youngest children are immersed in a media-saturated environment and frequently possess their own devices (Feierabend et al., 2022, 2024). The interviews revealed that when children use quaternary media independently, they predominantly engage with YouTube or play games on tablets. Only three children mentioned using educational apps on their iPads, while another child mentioned using his grandparents' iPad to show his grandfather how to operate it.



Figure 5: Interview Excerpt From Rabea, 6 Years Old

Only three children mentioned using educational apps on their iPads, while another child mentioned using his grandparents' iPad to show his grandfather how to operate it. However, in contrast to tertiary media, quaternary media are not primarily viewed or used by children as information sources. Additionally, there are significantly more restrictions around the use of quaternary media, especially with cell phones, which children are typically only allowed to use with parental permission and under supervision.

# Conclusion

In analyzing the interview data, several additional insights emerged: Many children are not even aware of where their knowledge about certain topics comes from, often saying they "just know" things. We also noticed, that Grandparents play an important role in children's media experiences, particularly with traditional media like newspapers and radio, which are often owned and used by grandparents.

However, based on the research results presented, the following conclusions can be drawn regarding the role of media in children's early political socialization and knowledge acquisition:

- 1. The primary socialization through the family is fundamental. Family interactions, especially conversations with parents, are an important source of early political and social knowledge for children. This underscores the crucial role of the micro-level environment in shaping children's understanding of current events and societal norms. Fathers, in particular, were frequently identified as the primary informants, indicating gendered dynamics in how political knowledge is shared within families.
- 2. Traditional media have limited reach among young children. Even though, research states that books still play an important role for children (Kieninger et al. 2020, 2023), the results of the interviews show that secondary media, such as books and newspapers, are not widely used by children for knowledge acquisition. This highlights a generational shift away from traditional print media, with many children perceiving them as irrelevant or associating them with adults or specific uses (e.g., crafts). One the one hand, this finding suggests a need to modernize educational strategies to engage young learners effectively. On the other hand, is raises significant concerns, particularly when considering the foundational role these media play in developing essential literacy skills. Literacy is not only critical for reading and writing but also serves as a gateway to

informed political participation as children grow into young adults and adults. Also, the absence of books and newspapers in the children's mentions of kindergarten suggests that educators may not be actively integrating these traditional media into early childhood learning environments. This omission represents a missed opportunity to foster foundational literacy skills and critical engagement with informational texts at a crucial developmental stage. Introducing books and newspapers in kindergarten settings could play a pivotal role in bridging the gap between early literacy development and later political and civic participation. Re-establishing the role of books and other traditional media in children's lives is not about resisting technological progress but about creating a balanced foundation for lifelong learning and participation. By fostering strong literacy skills through engagement with books and newspapers, society can prepare children not only for academic success but also for active, informed citizenship. Traditional media offer unique advantages in promoting sustained attention, critical thinking, and the ability to engage deeply with complex texts—all of which are indispensable for meaningful political and social participation as young adults and beyond.

- 3. The interviews showed that television is a pivotal informational medium for young children. Tertiary media, particularly television, play a central role in providing children with information about politics, civic responsibilities, and social issues. Educational programs such as *"Logo"* and *"Checker Tobi"* serve as valuable tools for imparting knowledge, blending entertainment with learning. Television's visual and accessible format appears well-suited to capturing children's attention and delivering meaningful content.
- 4. In fact, media's role in shaping civic understanding is multifaceted. As the results demonstrated, fictional content, such as "*Paw Patrol*," demonstrates that entertainment media can contribute to children's comprehension of societal roles, such as leadership and civic responsibilities. This finding indicates the potential of media narratives to influence children's understanding of governance and decision-making in society.
- 5. The analyses showed that quaternary media are ubiquitous but primarily recreational. While children are exposed to digital technologies and often possess their own devices, their usage tends to be recreational rather than informational. The reliance on platforms like YouTube or gaming apps highlights the entertainment-oriented nature of digital engagement. However, the restrictive and supervised usage of quaternary media underscores concerns about content suitability and safety.

Overall, the interviews not only provided important insights into the acquisition of political knowledge by children of pre-school and kindergarten age and showed that political knowledge is already acquired between the ages of 4 and 6. The findings also suggest that early childhood education should prioritize equipping children with the skills to critically engage with diverse media formats while leveraging the strengths of existing media, such as educational TV programs, to promote civic knowledge. Furthermore, there is a need for parents and educators to collaborate in creating environments that encourage meaningful conversations about societal issues, supported by age-appropriate media content. Addressing the gap between children's media consumption habits and their use of media for educational purposes will be key to fostering informed, socially responsible individuals from an early age.

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# Constructing the EXPAND Core Dimensions of Admission Strategies in Taiwan Higher Education

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#### Abstract

In the context of low fertility rate and the marketization of education, the admissions of higher education have faced numerous challenges. How higher education institutions can resolve these crises and turn them into opportunities have become indispensable issues that cannot be ignored. This study aims to construct the core dimensions of admission strategies in Taiwan's higher education through a mixed methods research approach. First, a literature analysis is conducted to understand the current situations of higher education admissions in Taiwan. Subsequently, core dimensions are generalized through psychology, sociology, and management. Finally, expert consensus is obtained through opinion reviews and expert consensus analysis by five experts. According to the results of this study, EXPAND core dimensions include six aspects: 1.Executive (E), 2. X-Development (X), 3. Promotion (P), 4. Agreement (A), 5. Network of Occupation (N), and 6. Daily necessity (D). The degree of consensus among the six core dimensions ranges from .95 to 1. That shows a high level of expert consensus. Based on the results, the study provides suggestions for higher education admission admission and research as well.

Keywords: Higher Education, Admission, Marketization of Education, Low Fertility Rate, Degree of Consensus (D.C.)

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# Introduction

In order to eradicate hunger and poverty, countries around the world pay attention to the environmental, economic and social needs such as health, education, sanitation, energy, employment, infrastructure, climate change, ocean and environmental protection of all genders and ages. Hoping to establish a partnership of equality, peace, inclusiveness and sustainable development by 2030, the United Nations (UN) proposed 17 Sustainable Development Goals (SDGs) in 2015, which include 169 sub-goals. The development of educational quality has become a sustainable development project around the world in order to achieve Goal 4: "Quality Education: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (United Nations, 2024).

There are 145 colleges and universities in Taiwan (Ministry of Education, 2024a). The Subparagraph 1 of Article 1 in University Act stipulates: "Universities shall have as their objectives conducting academic research, training and educating highly skilled people, enhancing culture, serving society, and boosting national development." And Article 2 stipulates: "In this Act the term, university, refers to a tertiary level educational institution that has been established in accordance with this Act and that confers bachelor's degrees and higher-level degrees" (Laws & Regulations Database of the Republic of China (Taiwan), 2019). Therefore, 145 colleges and universities must develop the functions of research, cultivation, service and promotion of national development in order to comply with the SDGs Goal 4 and comply with the spirit and provisions of the University Act.

However, statistics showed that Taiwan's fertility rate in 2023 was the lowest among the statistical subjects (CIA, 2024) and the birth rate has dropped sharply recently (Department of Household Registration of the Ministry of the Interior, 2024). The declining birthrate has led to a crisis in higher education admission, and many schools have even closed down (Chen, 2015). The Ministry of Education has disclosed the relevant information such as School under Early Warning and School under Special Guidance (Ministry of Education, 2024b). Under the influence of the marketization of education, students have more choices in school, and the admission competitiveness among higher education has also increased (Tan, 1998). Relevant empirical research has found that students or parents will evaluate the quality of education and their future. Field development, career development and school resource provision are listed as factors in school selection (Cheng, 2016; Ma et al., 2022; Shannon-Baker et al., 2020; Tang & Su, 2016;). It can be seen from this that Taiwan's higher education has faced many admission challenges due to the declining birthrate and the marketization of education. Chang (1999) suggested that the research results need to be consistent with the functions and goals of the university, and a complete system must be established. Therefore, a comprehensive analysis and research of what efforts are needed to solve the admission crisis in Taiwan's higher education have become important topics at present.

# **Literature Review**

# International Development Trends of Higher Education

Countries in the world are interdependent and global (Tsai, 2008). It is very important to overview the international practices and to internalize them into suitable education policies (Wu, 2008). Therefore, the following will explore the connotations of educational indicators

and projects proposed by international organizations to realize the development trends of higher education.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) proposed Education for All (EFA) to emphasize fairness, accessibility, and affordable high-quality higher education. The relevant projects include linking vocational skills, providing digital learning courses and policies, providing equal STEM resources for women, strengthening cross-border cooperative teaching and research programs, and reducing gender or other barriers in education training, providing lifelong learning opportunities, developing Global Convention on the Recognition of Qualifications concerning Higher Education, and Qualifications Passport for Refugees and Vulnerable Migrants (UNESCO, 2016, 2020, 2023).

The European Commission promotes the European Higher Education Area (EHEA) through micro-credentials, European Universities initiative, European Students European Student Card Initiative to build high-quality, relevant, connected, and innovative European higher education (European Commission, 2023).

The World Bank (WB) found that people who receive higher education can help them to reduce poverty and improve the entire educational system. Those who receive higher education will have better social stability and higher citizen participation. The goals of higher education are as follows: Strategically diversified systems, Technology, Equity, Efficiency and Resilience (The World Bank, 2021).

The Organization for Economic Cooperation and Development (OECD) is committed to analyze higher education policies and systems and provides higher education policies through the Group of National Experts on Higher Education (GNE-HE). The OECD focuses on improving student employability, evaluating the appropriate allocation of higher education resources (such as funds, etc.), and reviewing of the higher education policies through external organizations (OECD, 2023).

The Higher Education Evaluation and Accreditation Council of Taiwan is responsible for planning and executing higher education evaluation. School governance and management, teaching and academic disciplines of teachers, learning effectiveness of students, social responsibilities and sustainable developments are included in the evaluation indicators (Higher Education Evaluation and Accreditation Council of Taiwan, 2023).

# The Admission of Taiwan's Higher Education

The admission of higher education admissions in Taiwan can be divided into domestic, overseas and lifelong learning orientations. Domestic admission includes: (1) university admissions: Taiwanese students can take academic tests and select universities through special selection, test distribution, application for entrance, and Star Plan, etc. (University Admission Committee, 2024), and (2) four-year technical universities or two-year technical colleges admissions: Taiwanese students participate TVE Joint College Entrance Examination, joint registration and distribution, special selection, individual entrance admissions, etc. (Technical and Vocational Education Admissions Strategy Committee, 2024). After students entering the school, the students can transfer or have double major or take supplementary courses in accordance with the school regulations. The overseas admissions of Taiwan's higher education are independent admission, exchange students, personal selection, short-term study, college-affiliated Chinese centers, and overseas youth classes, etc. (Tsai &

Tang, 2023). Taiwan's higher education also has many lifelong learning admission projects, such as master's and doctoral degree courses, further education, and various credit courses, to meet the needs of various learners. Regardless of domestic, overseas and lifelong learning orientations, admission in colleges and universities must comply with the purposes of researching academics, cultivating talents, enhancing culture, serving society and promoting national development which are regulated in the University Act.

However, statistics from the CIA found that Taiwan's fertility rate ranked as the last place among 227 subjects (CIA, 2024). The birth rate has dropped sharply, and it can be estimated that the number of undergraduate students will reach a new low in 2028 and 2040 (Department of Household Registration of the Ministry of the Interior, 2024). The Ministry of Education revealed the list of School under Early Warning and School under Special Guidance (Ministry of Education, 2024b), and some research has explored the closure of private schools (Lu, 2015; Lin et al., 2018). The Measures for Promoting the Merger of National Universities clearly stipulates that the admission rate is one of the conditions for the merger of national universities (Laws & Regulations Database of the Republic of China (Taiwan), 2019). It is obvious that the admission of higher education has impacted the existence of public and private schools.

# The Theories and Empirical Studies of Higher Education Admission

Higher education admission strategies need to satisfy the needs of multiple parties, to maintain the quality of higher education, and to meet the social expectations. The Psychology can explore the mind, the Management can explore the executive patterns, and the Sociology can explore the context and expectations of society. Therefore, this study will be based on the theoretical and practical research in psychology, management, and sociology and researcher synthesized six core levels. The contents are as follows (Table 1 and Table 2).

Field	The Admission Contents	Core Dimensions			
Psychology	In order to improve the admission effect, we could provide reinforcers and models(1), conduct marketing through multiple coding principles(2), and meet the basic and growth needs of faculty and students(3, 4, 5, 6) to gain the recognition of the school (1).	agreement (1) promotion (2) daily necessity(3) x-development (4) network of occupation (5) executive (6)			
Management	Higher education administrative units should establish core team (1) to manage admission plans, oversee the process, support every unit, develop the most marketable hooks (2), and link marketing elements to demonstrate the school's strength in admission (3).	executive (1) promotion (2) agreement (3)			
Sociology	Higher education plays an important role in the social structure. Sociology theories emphasize the importance of resource assistance (1, 2), linkage to the job market (3), attachment and commitment goals, dedication and participation, and positive beliefs about the school (4), etc.	daily necessity (1) x-development (2) network of occupation (3) agreement (4)			

# Table 1: The Comparison Table Between Empirical Studies and Core Dimensions

References: Chang, 2004; Chiou, 2007; Chi & Su, 2006; Su & Chen, 2010; Hoffman & Maslow, 1996; Maslow, 1970; Ou et al., 2009; Uluçinar, 2021.

Table 2: The Definitions of Six Core Dimensions				
Dimension	Definition			
Executive (E)	The higher education units utilize scientific methods to manage admission strategies.			
X-development (X)	The higher education units provide resources to meet the teaching, learning, and research needs of faculty, staff and students.			
Promotion (P)	The higher education units manage marketing and promotion admission strategies and establish positive brand about the schools.			
Agreement (A) There are some hooks that enhance student, parents, vo alumni, and enterprise to attend or contribute to the school.				
Network of Occupation (N)	Multiple ways and people (such as teachers, alumni, senior, or enterprises, etc.) guide students' career development network. The higher education plans to assist students in constructing career goals, connecting career links, and cultivating skills during the study period.			
Daily necessity (D)	The higher education supplies the financial support for students' daily life, the safety caring of the environment and campus inside and outside, and the interpersonal interaction assistance.			

# **Research Method**

# Mixed Research Method Approach

This study aims to construct the core dimensions of admission strategies in Taiwan higher education through a mixed methods research approach. First, a literature analysis is conducted to understand the current situations of higher education admissions in Taiwan. Subsequently, core dimensions are generalized through psychology, sociology, and management. Finally, the research invites nine experts to supply quality opinions and invite five experts to conduct a quantitative analysis of the degree of consensus (D.C.) based on the EXPAND expert questionnaire (Likert 5 ranking scales) (Figure 1).



Figure 1: Research Procedure of Core Dimensions of Admission Strategies in Taiwan Higher Education

# Subjects

This study invited 9 experts (professors from public and private education-related institutes, or administrative directors of higher education, or directors of the National Academy for Educational Research) to provide qualitative opinions on the core dimensions of EXPAND, and 5 experts completed the expert questionnaire for five-ranking scale (1. Delete, 2. Substantially revise, 3. Revise some text and keep it, 4. Revise little text and keep it, 5. Keep it without revision) and conducted the D.C. analysis.

# Data Analysis

The D.C. analysis steps are as follows:

- 1. Calculate the average and standard deviation of the overall core dimensions of higher education admission and the six dimensions.
- Calculate the degree of consensus(DC.): DCj=1-CDIj. If DCj≥0.8, the dimensions can be retained or revised. If DCj<0.2, further discussion is needed to revise or delete according to expert opinions (Ye, 2009, pp. 147- 148). Consensus deviation index (CDI) is calculated as follows:</li>

$$\text{CDIj} = \frac{\text{Sj}}{\max j\{\bar{X}\}}$$

# Results

This study conducted mixed research method to explore the core dimensions of Taiwan's higher education admission strategy. The results of the qualitative and quantity analysis will be described below.

# The Qualitative Analysis Results (Matters Need Attention)

This study invited 9 experts to provide qualitative descriptions of the core dimensions of higher education admission strategy and proposed four matters need attention.

# 1. Higher education admission strategies should focus on the EXPAND dimensions.

In this study, 9 experts unanimously consider EXPAND six core contents as the higher education admission strategy, including: (1) Executive (E); (2) X-development (X); (3) Promotion (P); (4) Agreement (A); (5) Network of Occupation (N); (6) Daily necessity (D). The definitions of the core dimensions are reached to the consensus without revisions (see Table 2-2).

The EXPAND is compiled from the first English letter of six core dimensions. It is expected that the six core dimensions will be used to assist the implementation of higher education admission. The feedback from experts (numbers B and D) indicate that the research shows significantly practical contribution (for example, expert B described that "*The research topic is important*." and "*The research purpose is appropriate and can be expected to contribute*"; expert D described that "*The topic has important policy value and practical implications*"). Therefore, higher education admission strategies should pay attention to the work of the six dimensions-EXPAND and consider how the work can be promoted and implemented.

# 2. Each dimension of EXPAND is both independent and closely related.

Nine experts in this study unanimously agreed the EXPAND six core dimensions. Therefore, higher education admission work needs to pay attention to the planning and execution of them. Especially expert B mentioned: "...maybe x-development and network of occupation are similar to each other. Do they need to be distinguished? ...." That reminded us to continue explore the six core dimensions. It is possible that we plan to improve executive works so that each department pays more attention to the curriculum development (enhance x-development), training content (enhance network of occupation), and marketing (enhance promotion) etc. and vice versa. Therefore, each of the six core dimensions should be paid attention to so that other core dimensions will be induced.

# 3. EXPAND rely on every units' division and cooperation.

Experts attach great importance to the division of responsibilities and the cooperation among units in the school (for example, expert F described "*What are the admission missions of administrative unit?*"; and expert I described "*There are career guidance units in the school*"), and that reminds us to pay attention to the division responsibility and cooperation. For example, every department in the academic unit must develop the curriculum (including administrative and non-administrative teachers), the news center is in charge of promotion and shape the positive school images, the career guidance center must do the students' career training, the school security center must keep the school safety and comfort, and the volunteers, enterprise, alumni must supply some resources to support the school. Only by mutual support and assistance can achieve higher education admission goals.

# 4. Follow-up studies on the EXPAND implementation are needed.

Experts in this study attach great importance to the concrete executable work projects of EXPAND. For example, expert C described "*What are the detailed indicators of each dimension*?" and that remind us to study and explore the implementation projects in the future.

# The Quantitative Analysis Results

This study invited 5 experts to rank the questionnaire and conduct D.C. analysis. The analysis results from Table 3 show that the consensus analysis results of this study, the averages of the executive, x-development, promotion, agreement, network of the occupation, and daily necessity are 4.80, 4.75, 5.00, 4.80, 4.75 and 5.00 respectively, the standard deviations are .20, .25, .00, .20, .25 and .00 respectively, and the consensus levels are .96, .95, 1.00, .96, .95 and 1.00 respectively. All higher than the standard value of .80. Therefore, the six core dimensions of this study are above .80. Therefore, it shows that experts have a high degree of consensus on the six core dimension of the higher education admission strategy.

Itom dimonsion	Mean	SD	DC	Results			
			DC	Retain	Revise	Delete	
Executive	4.80	.20	.96	V			
X-Development	4.75	.25	.95	V			
Promotion	5.00	.00	1.00	V			
Agreement	4.80	.20	.96	V			
Network of the occupation	4.75	.25	.95	V			
Daily necessity	5.00	.00	1.00	V			

Table 3:	The	Core ]	Dimension	Ranking	Analv	sis of	the H	[igher]	Education	Admission
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# Conclusion

The purpose of this study is to construct the core dimensions of admission strategies in Taiwan's higher education through a mixed-methods research approach. We construct key components of higher education admission strategies through reviewing and converging the literature. This is further validated through qualitative and quantitative analysis by nine experts. The results reveal six core dimensions in Taiwan's higher education admission strategies: Executive (E), X-development (X), Promotion (P), Agreement (A), Network of Occupation (N), and Daily necessity (D). Four matters need attention are proposed, including Higher education admission strategies should focus on the EXPAND dimensions, Each dimension of EXPAND is both independent and closely related, EXPAND rely on every units' division and cooperation, and Follow-up studies on the EXPAND implementation are needed.

# Recommendations

# 1. Higher education admission strategies should pay attention to six core dimensions.

Through the mixed method analysis of this study, it found that higher education admission strategies should pay attention to six core dimensions. The principal is the leader of the school (Chen, 2021). In executive management, there is often lack of executive commitment to change. Problems such as resistance and good opinions failure to gain the commitment and trust of executive managers (Mukwawaya et al., 2022). Therefore, in order to enable principals to make better decisions, it is recommended that principals establish educational think tanks to plan, oversee, communicate, and coordinate the higher education admission strategies.

# 2. The multi-faceted efforts on curriculum and activities.

In order to enhance the recognition of staff and students with the school, it is suggested to provide abundant learning software and hardware resources, employ professional teachers, provide career training, build a safe and convenient school life, and add school characteristics and development content to the students' curriculum and activities. For instance, the introduction and transcription of the school song for music students, and the SWOTS technology used to analyze the current admission situation and future response of the education department, etc. Through the multi-faceted efforts, the faculty and students can learn about the school from the curriculum and activities, identify with the school and plant the seeds to contribute.

# 3. The follow-up studies are needed.

In the future, we can conduct a research on the practical operation work items of these dimensions, and construct detailed implementation indicators through quantitative (e.g., AHP, CFA, etc.) and qualitative analysis. In addition, how to cultivate the most critical core dimension work items due to limited resources and time.

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#### Integrating Artificial Intelligence (AI) Literacy Into Curricula: The Case of Agricultural Sciences at the University of Helsinki

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#### Abstract

In this study, the concept of AI (artificial intelligence) literacy is evaluated prior to the curriculum planning of the BSc Agricultural Sciences programme. The chosen methodological approach was an integrative literature review, including conceptual structuring of the review, a description of the method, and a review and critical analysis of the literature on AI literacy and its integration in curricula. This process involved synthesising knowledge from literature, AI literacy policies, and practices in the degree programme. In total, 58 literature sources were examined. For BSc Agricultural Sciences students, AI literacy is important in two main areas: agricultural AI applications and the use of AI in studies and research. There is no established definition of AI literacy; a variety of approaches were gathered from the literature. First, AI literacy includes the cognitive elements of both knowledge and skills relating to the content, applications, use, ethics and evaluation of AI, as well as creating with AI. Second, AI literacy contains psychological and metacognitive elements. Additional aspects of AI literacy include targeted learning outcomes, social norms, access to AI tools, critical evaluation and disciplinary knowledge. A visual summary of the literature is presented as an AI literacy framework. Options are proposed for the addition of AI into the constructive alignment table (a leadership spreadsheet tool). The AI literacy framework can be used in developing both the curriculum and the planning tool. We present suggestions to be discussed regarding the inclusion of AI literacy in the forthcoming curriculum of the BSc Agricultural Sciences programme.

Keywords: Artificial Intelligence, AI Literacy, Higher Education, Curriculum, Agricultural Sciences

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#### 1. Introduction

The use of artificial intelligence (AI) is currently a strong trend; one that higher education, like other sectors, needs to respond to (Bearman et al., 2023; Southworth et al., 2023; Essa, 2024). In addition to reading, writing, arithmetic and digital skills, AI literacy is an important skill for both work and everyday life in the 21<sup>st</sup> century (Ng et al., 2021). Lintner (2024) summarises that 'AI literacy is the ability to understand, interact with, and critically evaluate AI systems and AI outputs.' In this literature survey, the concept of AI literacy is discussed in more detail to help with future curriculum planning in Agricultural Sciences at the University of Helsinki.

According to Yi (2021), the purpose of AI literacy is to have the capability to anticipate an uncertain future. It is important for universities to state clear aims for the use of generative AI (GenAI) and to improve the AI literacy of their students (Song, 2024). In February 2023, the University of Helsinki, Finland, stated that AI is primarily an opportunity and an important work-life skill for students, and that teachers are encouraged to integrate AI teaching into their courses (UH, 2024b, guidelines updated in May 2024). However, teachers may limit or prohibit the use of AI in their courses for pedagogical reasons.

Confidence or self-efficacy (SE) beliefs about learning AI, opinions on the relevance of AI, anxiety towards AI, and AI literacy can all affect students' readiness for learning AI (Dai et al., 2020). The majority of first-year students in Agricultural Sciences (57.6%) viewed the use of AI in studying and research positively, and a quarter of them wanted teaching on the use of AI (Elo et al., 2024). Their readiness and SE belief towards AI was highest for the ethics dimension and lowest for the cognition dimension; the skills and vision dimensions fell in between. Based on that study, AI workshops and lessons have since been arranged for these students. However, there remains a need to discuss the position of AI at the curriculum level as well.

The curricula of the BSc programmes at the University of Helsinki are updated every four years; the next curriculum (for the years 2026–2030) will be drafted in 2025. This survey is driven by the input and needs of various scientific fields, AI development and developers, the workforce, students and active teachers. The aim of this literature survey is to sketch the concept of AI literacy for the purposes of a) developing university teaching in Agricultural Sciences with regard to AI, and b) helping plan the curriculum of the BSc Agricultural Sciences programme. Section 2 presents the methodological approach while Section 3 outlines different approaches to AI literacy. Section 4 includes a visual summary of Section 3 to be considered as a loose AI framework for curriculum planning. The practical aim of this study is to continue the discussion about including AI teaching in the next curriculum for the academic years 2026–2030. This text does not discuss details of e.g., technical content or ethics, but rather sketches a holistic picture of AI literacy. There is literature available on these omitted details; e.g., EU guidelines (EU, 2022) and a review by Ashok, Madan, Joha, and Sivarajah (2022) focusing on ethics.

#### 2. Methodological Approach

The chosen methodological approach was an integrative literature review (Torraco, 2005; Lubbe et al., 2020), including conceptual structuring of the review, a description of the method, and a review and critical analysis of the literature on AI literacy and its integration in curricula. This process involved synthesising knowledge from existing literature, AI literacy

policies, and practices in the Agricultural Sciences degree programme. In total, 58 literature sources were examined.

#### 3. AI Literacy

#### 3.1 Basic Elements and Models of AI Literacy

AI has been defined as 'software that is developed with one or more of the techniques and approaches [...] and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments it interacts with' (EU, 2022). There is no established definition of AI literacy (Laupichler et al., 2022; Ng et al., 2021; Ng et al., 2023; Walter, 2024), but the basic concept (Lintner, 2024) was presented in Section 1.

AI literacy has its roots in functional, social and technological literacy (Yi, 2021). Functional literacy refers to foundational competences, i.e., the ability to read, write and calculate. Social literacy means understanding texts on a deeper level (critical thinking and social practice), while technological literacy consists of technological intimacy and designing one's social future (Yi, 2021). AI literacy uses the ideas of data science, computational thinking and multi-disciplinary knowledge (Ng et al., 2021). It includes cognitive, metacognitive (knowing what to know), affective (emotions and state of mind) and socio-emotional competencies, which are grounded in universal moral values (Schüller, 2022).

An early concept of AI literacy by Kandlhofer, Steinbauer, Hirschmugl-Gaisch, and Huber (2016) was computer science focused: the topics included problem solving by search, sorting, graphs and data structures. According to Laupichler et al. (2022), Kandlhofer et al. (2016) were the first to coin the term AI literacy in a peer-reviewed article.

A common current concept of AI literacy includes the knowledge and skills to use AI in two main domains (Chan & Hu, 2023; Alamäki et al., 2024; Walter, 2024): first, technology and the working principles of AI; second, the ethical and societal impacts of AI. Zhang et al. (2023) include a third main domain for middle school students to learn about AI, namely career futures in the AI era. The aim of developing AI literacy as a work-life skill was also addressed in the development of curricula at the University of Florida (Southworth et al., 2023). Similar to the University of Helsinki's guidelines (UH, 2024b), Chan and Hu's study in Hong Kong (2023) encouraged higher education institutions to prepare students for a future in which GenAI (generative AI) technologies (UNESCO, 2023) are prevalent.

# **3.2** Further Developing the Concept of AI Literacy: Disciplinary Knowledge, Taxonomic Levels, Ethics, and Affective and Behavioural Domains

For teaching AI within the discipline of Agricultural Sciences, two types of AI applications should be considered in order to offer students AI work-life skills. The first type is AI applications specifically for studies and research (e.g., the literature reference tool Keenious), and the second is agricultural applications (Table 1). All of these include competence in both the discipline and in AI. Generative AI (GenAI, e.g., ChatGPT) is included in these two main areas.

Target of use of AI	Reference
techniques in agriculture	
Crop planning and selection	Jha, Doshi, Patel, and Shah (2019); Subeesh and Mehta (2021);
	Cavazza, Dal Mas, Campra, and Brescia Cavazza (2023)
Yield prediction	Akkem, Biswas, and Varanasi (2023); Ganeshkumar, Jena, Sivakumar,
	and Nambirajan (2023)
Energy efficiency	Ganeshkumar et al. (2023)
Optimisation of fertiliser	Talaviya, Shah, Patel, Yagnik, and Shah (2020); Subeesh and Mehta
and pesticide use	(2021); Ganeshkumar et al. (2023); Sachithra and Subhashini (2023)
Water resource management	Subeesh and Mehta (2021); Ganeshkumar et al. (2023)
and irrigation	
Forecasting of e.g., crop	Akkem et al. (2023); Sachithra and Subhashini (2023)
yield production	
Greenhouse management	Ganeshkumar et al. (2023)
Automated milking and	Sachithra and Subhashini (2023)
livestock management	

Table 1: Typical A grigultural Applications	of AI (Ele at al. $2024$ )
Table 1. Typical Agricultural Applications	01 AI (EI0 et al., 2024)

AI literacy has also been approached from a taxonomic perspective (Krathwohl, 2002). Ng et al. (2021) listed six taxonomic levels of AI literacy (Table 2). Sustainability is a key concept in the curricula at the University of Helsinki (Pietikäinen et al., 2024). At a Finnish university of applied sciences, Alamäki et al. (2024) developed a taxonomy of AI literacy in sustainable development, which includes educational goals integrating the targeted learning outcomes for AI, the discipline (sustainability) and generic work-life skills. Examples of taxonomic learning outcomes relating to sustainability and AI are included in Table 2.

Taxonomic et al., 2021)	levels 1–6 (Ng	Explanation of learning outcomes (Ng et al., 2021)	Examples of learning outcomes for general AI (Ng	Examples of learning outcomes for AI in sustainable development (modified from Alamäki
			et al., 2021)	et al., 2024)
5–6 Evaluate and create AI	6 Create	Produce new or original work	Design, assemble, build and develop AI applications	Can create a concept plan about the ways AI will create value for a specific environmental problem in developing its sustainability
	5 Evaluate	Justify a stand or decision	Appraise, predict, detect and justify decisions with AI applications	Can critically evaluate and justify an AI solution for a specific environmental problem in developing its sustainability
3–4 Use and apply AI	4 Analyse	Draw connections between ideas	Organise, compare, decompose and abstract an AI problem	Can produce a report about the adoption of an AI-based solution that reduces environmental impacts affecting the life of humans in an area
	3 Apply	Use information in new situations	Execute, implement, use and apply AI applications in different contexts	Can use AI-based energy optimiser for a one-family house by selecting, registering, and applying it for a selected case
1–2 Know and understand AI	2 Understand	Explain ideas or concepts	Describe, explain, interpret and demonstrate the meaning of AI	Can describe key principles in using AI for energy savings, such as optimising heating costs based on the weather forecasts
	1 Know	Use information in new situations	Copy, reproduce, recall and memorise AI concepts	Can describe that AI can be used for energy savings and minimising waste

Table 2: Bloom's Taxonomy (Krathwohl, 2002) and AI Literacy (Ng et al. 2021) With
Disciplinary Examples (Alamäki et al., 2024)

Chiu (2024) underlined that disciplinary knowledge is essential for the appropriate use of GenAI. He recommended that at course level, students should be taught the foundations of their discipline prior to studying with GenAI so that they are able to critically evaluate AI. In a group work scenario, both knowledge of AI and disciplinary knowledge were found to be essential for successful learning (Alamäki et al., 2024). Walter (2024) highlighted the effectiveness of class-wide collaborative prompt engineering sessions, in which students and teachers experiment together with different prompts.

Ng et al. (2021) and Ng et al. (2023) added a fourth cognitive category, AI ethics, which runs parallel to all taxonomic levels. Furthermore, Ng et al. (2023) added affective and behavioural domains to the AI literacy framework. These domains concern key aspects in teaching, for example: are students interested in AI; what are their aims and attitudes

concerning AI; what do they believe they can learn about AI; and what are the individual and collaborative components in learning AI?

In addition to students' ability to use AI related knowledge and skills, Dai et al. (2020) included students' ability to access such knowledge and skills as a component of AI literacy.

#### **3.3 Scales for Measuring Students' AI Literacy**

Different scales have been developed for measuring students' AI literacy. Wang et al. (2022) utilised the four basic dimensions described by Ng et al. (2021), Ng et al. (2022), and Ng et al. (2023) to develop an AI literacy scale. In addition to the four categories proposed by Ng et al. (2021), Carolus et al. (2023) added self-management items to their AI literacy scale. The constructs were divided into four groups of psychological competencies: the ability to manage one's own emotions while interacting with AI; the ability to recognise whether one's decisions are influenced by AI, and to stop this influence; the ability to solve problems encountered while working with AI; and the ability to stay up to date with current developments and keep oneself informed about new AI applications (Carolus et al., 2023).

Understanding the limitations of AI and the reasons for AI problems – namely hallucinations, alignment (AI does not necessarily do what we want), self-governance or runaway, discrimination or bias due to the data used in training AI, and getting stuck in a certain narrative (Walter, 2024) - is an essential part of all components of AI literacy. In their definition of AI literacy, Long and Magerko (2020) emphasised critical evaluation and collaborative use of AI as a tool: 'AI literacy is a set of competencies that enables individuals to critically evaluate AI technologies; communicate and collaborate effectively with AI; and use AI as a tool online, at home, and in the workplace'. They divided the core competencies of AI literacy into five main questions: what AI is, what it can do, how it works, how it should be used, and how people perceive it. Based on the study by Long and Magerko (2020), Hornberger, Bewersdorff, and Nerdel (2023) developed an AI literacy test for Germany. UNESCO (2022) also utilised Long and Magerko's (2020) work in an AI literacy competence framework for K-12 education, from kindergarten through to the 12<sup>th</sup> level. This framework includes elements from Table 1, but in a less concise order. UNESCO (2022) included knowledge, understanding, skills and value orientation in AI literacy: 'AI literacy comprises both data literacy, or the ability to understand how AI collects, cleans, manipulates, and analyses data; and algorithm literacy, or the ability to understand how AI algorithms find patterns and connections in the data, which might be used for human-machine interactions' (UNESCO, 2022). In Finland, AI regulations for K-12 education are currently being prepared (OKM, 2023). AI is mentioned in digital skills for grades 7–9 (OPH, 2022) and programming competences have been defined for K-12 education (EDUFI, 2024).

# **3.4 Elements of AI Literacy as a Visual Framework for Discussion of AI in the Curriculum**

Concerning AI, Ng et al. (2023) describe the aim as providing students with adequate AI literacy. To advance the AI literacy of Agricultural Sciences students, elements of AI literacy from Section 3 have been collected in Figure 1 as a framework for discussion of AI in the curriculum. For this group of students, the term 'discipline' in Figure 1 refers to Agricultural Sciences. Based on the literature, this visual framework presents different aspects that could be discussed when planning AI teaching in higher education. The definitions, relations and

causality of the items in the framework vary across the theoretical models found in the literature.



Figure 1: Framework of AI Literacy and Related Aspects for Curriculum Planning Discussion. Items in yellow font were modified from Ng et al. (2021), Ng et al. (2022) and Ng et al. (2023). Other references: Chai et al. (2021); Dai et al. (2020); Carolus et al. (2023); Wang et al. (2023); Fundi et al. (2024); Kong, Cheung, and Tsang (2024).

#### 4. AI Literacy in Curriculum Planning in Agricultural Sciences

The general structure of the BSc Agricultural Sciences programme includes foundational science courses of scientific bases, the discipline itself and general work-life skills. A general pedagogical framework for the curriculum and course structures is constructive alignment (Biggs & Tang, 2011), including targeted learning outcomes (Krathwohl, 2002) for both the BSc degree and individual courses.

Finnish universities formulate their curricula independently (OKM, 2009; Holmén, 2022). There is a lot of autonomy, with the curricula being written by teachers (i.e., professors, lecturers, degree programme directors). Degree programme-specific curricula are designed and drafted in accordance with university-wide principles and guidelines (Pietikäinen et al., 2024). The curricula are approved by faculty councils as proposed by the degree programme executive boards. Curriculum planning at the University of Helsinki's Faculty of Agriculture and Forestry includes defined aims and deadlines, as well as individual and collaborative working by teachers. Students are also involved in certain phases of the planning. UNESCO (2023) suggests even wider collaboration with other stakeholders such as researchers, copyright experts, and AI providers and engineers when it comes to system-level curriculum planning. The visual framework summarising the literature on AI literacy (Section 3.4, Figure 1) will help in discussions between all participants involved in developing the curriculum for Agricultural Sciences.

In China, Dai et al. (2020) stated that the knowledge and skills constituting AI literacy are often included in learning objectives when developing curricula, keeping the future society in mind. The introduction of AI concepts and applications in various subjects and grade levels

was recommended by the International Society for Technology in Education (ISTE, 2023). Southworth et al. (2023) stated that AI theories and applications should be integrated in higher education curricula, rather than being only a small additional element in courses. They listed five categories related to the learning of AI in the University of Florida's curricula (ibid.):

- 1) Skills (courses) that enable understanding of AI, e.g., programming and statistics;
- 2) Knowledge, understanding and applications of the basic functions of AI;
- 3) Ethics of AI;
- 4) Using and applying AI;
- 5) Higher order thinking skills: evaluating and creating AI.

At a Swiss university of applied sciences, Walter (2024) recommended both AI literacy courses and the integration of training in the use of AI into different courses in the curriculum. The Faculty of Bio-Science Engineering at the University of Gent, Belgium, currently aims to integrate generative AI (or, more broadly, digital competencies) into its curriculum (Uyttendaele & De Caluwé, 2024).

Based on the literature and benchmarking of other universities, our intention is to visibly include AI in the next four-year curriculum (aims, learning outcomes, course activities, evaluation) of the degree programme, although not on every single course. Existing resources and possibilities to be discussed collegially within the Department (and perhaps also within the Faculty) are listed in Table 3.

Resource or action concerning AI in	University of Helsinki	Department and BSc Agr. Sci. programme (possibly FAF)
Fostering an environment that promotes AI: encouraging questioning, exploring, and critical assessment of AI (Walter, 2024)	<ul> <li>Guidelines for using AI in teaching (UH, 2024b)</li> <li>AI workshops for teachers</li> <li>Regular updates for teachers about AI</li> </ul>	<ul> <li>Assistant Professor in distributed AI in agriculture 2024-&gt;</li> <li>AI workshops for teachers?</li> <li>Examples of AI exercises and rules for courses (possible future action in Agr. Sci.)</li> <li>Pedagogical Moodle page for Agr. Sci. teachers (Kymäläinen et al., 2023)</li> </ul>
AI training for teachers (Walter, 2024)	Currently eight AI MOOC courses	<ul> <li>Teacher meetings</li> <li>Curriculum workshops (FAF)</li> <li>Possibly AI workshops for teachers</li> </ul>
Equitable access to AI tools for students (Dai et al., 2020; Song, 2024; Walter, 2024) Agricultural students' research about AI	GenAI tool Curre.chat (UH, 2024a), reference searching application Keenious (UH, 2024c)	<ul> <li>Information for teachers about the tools</li> <li>Examples of AI exercises and rules for courses</li> <li>Studies about the AI readiness of BSc Agr. Sci. and FAF students (Elo et al., 2024; Kymäläinen, Elo, and Södervik, 2024b; unpublished data)</li> </ul>
Teaching and curriculum adaptation (Dai et al., 2020; Southworth et al., 2023; Walter, 2024)		<ul> <li>AI workshops for Agr. Sci. students, grant by FAF in 2024 (Kymäläinen, von Cräutlein, Elo, Galambosi, and Honkanen, 2024a); currently voluntary, but voluntary or obligatory in the future?</li> <li>Integrating learning of AI into work-life skills courses and some disciplinary courses by the teachers responsible (Pietikäinen and Kymäläinen 2024)</li> <li>What about particular courses focusing on AI?</li> <li>AI as a work-life skill for students to be discussed in BSc portfolios</li> <li>Collecting AI exercise experiments</li> <li>Discussions of the steering committee of the BSc Agr. Sci. programme</li> <li>Curriculum workshops, departmental</li> </ul>

Table 3: Existing and Future Resources and Actions at Different Organisational Levels at the University of Helsinki, Concerning Suggestions and Recommendations About AI. Agr. Sci. = Agricultural Sciences, FAF = the Faculty of Agriculture and Forestry.

Pedagogical approaches for AI literacy include discovery and inquiry-based learning, collaborative learning, constructionism, project- or problem-based learning, storytelling, and hands-on or playful learning (Ng et al., 2021). Assessment methods may need to be re-evaluated in the GenAI era (Francis, 2024). Recent Agricultural Sciences curricula have been updated using a practical and simple pedagogical spreadsheet tool: the constructive alignment table, which includes elements of the course concept (includes 7 sub items), course activities for students (10 items) and evaluation (8 items) laid out in a spreadsheet (Kymäläinen et al.,

and subfield teacher meetings

2023). Core contents and targeted learning aims are also presented in columns. Examples and instructions for teachers are presented in a second sheet of the spreadsheet. The teachers responsible add check marks to the elements included in individual courses. AI is not mentioned in the current version of the alignment table. The AI framework (Section 3.4, Figure 1), can be used in planning the curricula frame and developing the spreadsheet planning tool.

 Table 4: Possibilities for the Inclusion of AI in the BSc Agricultural Sciences Programme's Constructive Alignment Table.

'Column' indicates there will be a space in the spreadsheet for check marks to be m	ade
by the teacher responsible for the course. GenAI = generative AI.	

Option	Addition to the constructive alignment table tool	Comments
А	One column for AI in the	This is a minimum option. Practical examples from options
	course activities section	B and C, examples of course assignments and GenAI rules are mentioned in the second sheet of the spreadsheet.
В	Two columns for AI:	Practical examples from option C, examples of course
	a) AI applications in	assignments and GenAI rules are mentioned in the second
	agriculture	sheet of the spreadsheet.
	b) GenAI in course assignments	
С	Several columns for AI, e.g.:	Examples of GenAI rules and course assignments are
	a) AI applications in agriculture	mentioned in the second sheet of the spreadsheet.
	b) GenAI in course	
	assignments	
	c) GenAI rules are mentioned	
	in course assignments	
	d) GenAI is included in	
	course assignments	
	e) Different domains of Al	
	literacy (Figure 4) are	
	mentioned in columns	

#### 5. Conclusions

For Agricultural Sciences students, there are two main areas in which AI literacy is important: agricultural AI applications, and the use of AI in studies and research. Generative AI (GenAI) is considered to be included in both of these two main use areas.

In this literature survey, an AI literacy framework was sketched to be used in collegial discussions for curriculum planning in the BSc Agricultural Sciences programme. Although there is no established definition of AI literacy, key elements were derived from the literature. These include cognitive elements related to knowledge and skills about the content, applications, use, ethics, evaluation and creation of AI, as well as metacognitive elements (affective and behavioural domains). Further important perspectives on AI literacy include targeted learning outcomes organised according to Bloom's taxonomy, social norms, access to AI tools, critical evaluation and disciplinary knowledge.

Finnish university teachers have a high degree of autonomy in planning the curricula. Curriculum planning includes possibilities for collegial discussion. The University of Helsinki has outlined basic guidelines for AI in studies and teaching. We see it as useful to include AI teaching in the next Agricultural Sciences curriculum, and have suggested topics and questions to be discussed regarding the inclusion of AI literacy in the forthcoming Agricultural Sciences curriculum.

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#### Characterization of Self-Regulation of Learning as an Executive Function in Students Within Virtual Learning Environments

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#### Abstract

Virtual Learning Environments (VLE) are part of the academic offerings of higher education institutions, defined as the space created through information and communication technologies where a series of environments converge to facilitate analysis, reflection, and appropriation of knowledge (Ramírez García et al, 2021). In these environments, selfregulation of learning is relevant for satisfactory academic performance. Self-regulation is a process by which students control their thoughts, actions, and emotions to achieve specific learning goals (Zimmerman et al., 1996). Executive functions are cognitive skills that allow planning, organization, decision-making, and impulse control, which are fundamental for effective self-regulation (Barkley, 2012). The purpose of this study is to characterize the profile of self-regulation, as an executive function, in graduate students and executive careers participating in Virtual distance education at a university located in northwestern Mexico. The project was developed following a non-experimental methodology, a quantitative approach, correlational and cross-sectional scope. Two assessment instruments were used: the Behavior Rating Inventory of Executive Function, Self-Report (BRIEF-A) and the Motivated Strategies for Learning Questionnaire (MSLQ). This paper presents the results of the first of two phases, which consisted of a pilot test of the BRIEF-A instrument with 71 students, obtaining relevant information on executive functions related to planning, organization, selfmonitoring and metacognition.

Keywords: Self-Regulation, Online Learning, Executive Functions, Higher Education

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#### Introduction

In the contemporary educational context, the growing prevalence of distance education poses significant challenges and opportunities for effective learning. In this sense, the issue of self-regulation strategies (SRA) in virtual environments becomes relevant, as this skill is positioned as a crucial ability for students to optimize their learning process. The ability of students to manage their own cognitive, emotional and behavioral resources becomes a determining factor in achieving academic success in these contexts (Cabrero-Almenara & Palacios-Rodríguez, 2021).

One of the fundamental purposes of contemporary higher education is to encourage students to become active agents capable of self-regulating their own learning process. Facilitating the formation of competencies that enable students to learn autonomously is perceived as one of the significant challenges of today's university, as pointed out by Cerezo et al. (2015) in Castro, Suárez and Rivera (2021).

Vélez-Torres (2023) states that in recent years, distance education has increased the offer of diverse online courses. University students have chosen this modality due to the advantages it offers. In response to this trend, institutions provide students with educational tools that give them academic and professional preparation to access better job opportunities. In particular, for graduate students, this offer allows them to update themselves in the work environment, in order to improve their quality of life.

However, it is observed that most students are not properly equipped to meet the requirements demanded by a distance education, since they lack self-regulation skills (Schober et al., 2015, as cited in Saez et al., 2018). The absence of these competencies to manage the learning process constitutes a fundamental element in cases of low academic performance in Higher Education, studies have found that in order to decrease dropout it is essential to address and mitigate the frustrating experience that students may feel due to problems related to the virtual environment, as well as situations related to the self, technical, academic or economic factors (La Madriz, 2016).

Therefore, it is expected that the graduate student, who participates in distance studies, has significant control over his learning process. In order to further explore this dynamic, the present study will focus on analyzing how students self-regulate their learning process in virtual environments with the purpose of elaborating a profile of them, as a first step to support them in this process.

Feo (2013) emphasizes that in the context of virtual environments, it is the student who must become aware of the need for autonomous, independent and self-directed learning, according to the demands of the study environment in which he/she finds him/herself. In conclusion, it is emphasized that in the distance modality it is feasible to incorporate face-to-face meetings mediated by printed and/or technological devices, which can complement or explain a process or information that has been initiated at a distance, thus facilitating learning to be genuinely meaningful.

A necessary element to consider is the relationship of ARA with academic performance (Dieser, 2016). Since this element is manifested in the direct influence it has on school dropout (Velázquez et al., 2017) and academic failure (Gilar-Corbi et al., 2020), both in face-to-face and virtual environments (La Madriz, J., 2016). Given the importance of

understanding and addressing these phenomena, it is essential to further examine the protagonist role assumed by the student in virtual environments, as pointed out by Rizo-Rodríguez (2020). This protagonism requires a significant willingness to address both individual and shared activities and work.

According to data from the National Institute of Statistics, Geography and Informatics (INEGI), of the population enrolled in the 2021-2022 cycle, 60.5% of higher education students were enrolled in distance mode. As for the hybrid modality, 26.8% of the students were enrolled. In relation to the media used for classes, the most used were virtual classes 62% and virtual platforms 60.5%.

La Madriz (2016) states that the challenge to be faced by virtual learning environments, in their effort to decrease the dropout rate among users, is to encourage students to develop the ability to discern, analyze and evaluate the content they are learning, instead of merely being passive consumers of the information available on the network.

Regarding school dropout data with respect to distance education in Mexico, Statista (2023) states:

In the case of higher education, which includes universities and other technical and vocational education institutions, it is estimated that at least 305,000 students stopped attending classes. This represents 8% of the student body. According to a survey conducted between April and May 2020, almost two-thirds of the university students surveyed in Mexico were enrolled in face-to-face programs.

According to the Regional Monitoring Report SDG4-Education 2030 published by UNESCO, UNICEF and ECLAC (2022), progress towards achieving education for all throughout life in Latin America is in a complex situation, due to the fact that the educational goals for the five-year period from 2000 to 2015 have not been met. At the same time, the effects of the pandemic and the need to meet the goals foreseen for 2030 generated important tensions that have compromised educational equity and quality education, in part generated by the transfer to the virtual environment without adaptation periods (Huerta-Estévez et al., 2023).

Among the factors that best explain academic performance are those related to the way in which students study and learn (González-Pienda, 2003), set goals, manage their time, that is, the way in which they manage their learning (Panadero, 2014). Thus, Self-Regulation of Learning (SRL) in recent decades has received increasing attention in terms of its promotion in students, since it enables not only better academic results, but also greater autonomy and motivation, a clear protagonism in their learning process and a necessary ability to transfer to different situations. Therefore, it is relevant that the graduate student acquires autonomy, understands his cognitive processes and develops the ability to regulate his learning process (Torrano et al., 2017), in the virtual environment.

#### Justification

In this scenario, the present research is considered to have different contributions. Regarding its theoretical contribution, it contributes with inputs to the analysis of academic performance and its relationship with ARA and executive functions of students in a private subsidized school. Therefore, it is relevant to characterize the profiles of students in virtual environments, which will allow the development of attention programs that assist students to improve their ARA. According to Gaeta et al, (2016) when students feel competent to self-regulate their learning, their motivation towards study and academic performance improves.

Regarding the practical and social implications, the findings of the study will provide students, teachers and school authorities with a specific profile of graduate students in virtual environments, as well as resources for the development of ARA training programs from an integrative perspective, not only for students, but also to promote its implementation from the teaching practice. In addition, by evaluating students' ARA strategies, it is possible to understand what are the current practices? Identify areas for improvement, promote effective learning and personalize support, providing support for strategies that will lead them to a more successful academic performance and to complete their studies by improving their ability to direct and control their own learning in virtual environments.

#### State of the Art

#### **University Education in Virtual Environments**

Distance education is an educational approach in which the student is in a geographically separate location from the teacher. It can be employed independently or combined with other educational modalities, including face-to-face contact. In this method, students are physically away from the educational institution (Simonson et al., 2015, p. 34).

Rodríguez León and Alonso Núñez, citing UNAM, define distance education as "an asynchronous teaching and learning model, through a computer and educational platform" (Universidad Nacional Autónoma de México [UNAM], 2013, p. 6).

In a virtual environment, Rizo-Rodriguez (2020), points out that the role of the university student acquires a role in which the need for considerable willingness to actively participate in both individual and collaborative activities is highlighted, in addition, he emphasizes the importance of student autonomy to develop fundamental technological skills to acquire knowledge and professional competencies, the capacity for self-management, which is manifested in self-discipline, self-learning, critical and reflective analysis, as well as collaborative work.

#### Self-Regulation of Learning

Self-regulation of learning (SRL) is a process through which the student controls and directs his/her own learning, incorporates cognitive, affective, metacognitive and motivational aspects, and also involves social issues by requesting help and support from others (Panadero, 2014). In higher education, ARA is a key term given that it promotes student autonomy by eliciting competencies that favor academic performance (Barrios et al., 2017). Although self-regulation is linked to health management, stress control, and even to less complex processes such as the performance of routines, it also includes the use of tools that allow describing how people monitor and adjust their own cognitive processes in the educational context (Zeidner et al., 2000 as cited in Puustinen & Pulkkinen, 2001).

The description of ARA that has had the greatest consensus among experts on the subject is understood as "the control that the subject performs over his/her thoughts, actions, emotions

and motivation through personal strategies to achieve the goals he/she has established" (Panadero & Tapia, 2014, p. 451) in academic situations, such as preparing for an evaluation or performing school tasks (Zimmerman & Schunk, 2011, as cited in Trías and Huertas, 2020). Thus, ARA is a process of reflection and action through which the student organizes, monitors and evaluates his or her learning; it is related to greater appropriation of content, more engaged participation in studies and higher academic performance (Trías & Huertas, 2020).

#### **Executive Functions**

It is essential to understand the level of development of executive functions in the student population and to strengthen those areas, skills or specific dimensions within these functions that present low levels of development. To some extent, the academic success of students depends on this strengthening (Cascante et al., 2015).

Executive functions have been investigated in the field of neuropsychology, providing valuable knowledge that enriches various scientific and professional disciplines. In the educational field, the application of this neuropsychological knowledge is significant, as it contributes to improve educational processes to achieve effective learning in students. This is especially relevant given that executive functions play a crucial role in control, regulation and planning, allowing people to engage in and successfully complete various actions (Lezak, 1994, cited by Flores & Ostrosky-Shejet, 2013).

#### **Executive Functions: Concept**

Moret and Mazeau, 2013 (cited in Soprano, 2014) state that the meaning of executive functions (EFs) has not been clarified or agreed upon, however the approaches to it, define it as the set of abilities of direction, control and regulation of cognitive processes, emotions and behavior that are used to solve problems in an appropriate way, in the face of the events that arise. "Evidently it is a heterogeneous construct, with a broad spectrum and imprecise limits, with frequent overlaps with functions belonging to other domains of the cognitive area, as well as emotional, and which can also have a fairly distant relationship with each other" (p. 102).

The literature identifies more than twenty EFs: organization, planning, anticipation, inhibition, working memory, flexibility, verbal fluency, visual fluency, self-monitoring, common sense, creativity, metacognition, behavioral regulation, emotional control, and several others (Soprano, 2014).

#### Methodology

The present study corresponds to a non-experimental research, with a quantitative, crosssectional and correlational method design. The project was developed in 12 months, divided into 2 stages. The first part was the application of the BRIEF-A pilot test to higher education students.

The study group consisted of students from the School of Business and Management and the School of Engineering (N=71), of which 42 % were female, 55 % were male and 3 % preferred not to answer. The participants were chosen by non-probabilistic sampling.

Participation was anonymous and voluntary, without compensation, and they had the option to withdraw from the study at any time.

The instrument was administered through Google Forms, and the responses were compiled in Google Sheets, ensuring that only the research team had access to the information. For data analysis, Microsoft Excel and JASP, an open access software specialized in statistical analysis, were used.

#### **Research Instrument**

The Behavioral Rating Inventory of Executive Function-Adult Version (BRIEF-A) is a standardized self-report measure that captures adults' views of their own executive functions, or self regulation, in their everyday environment. It is designed to be completed by adults between the ages of 18 and 90 years (2005).

The BRIEF-A is composed of 75 items within nine theoretically and empirically derived clinical scales that measure different aspects of executive functioning: Inhibit, Shift, Emotional Control, Self-Monitoring, Initiative, Working Memory, Plan/Organize, Task Monitor, and Organization of Materials. Also the clinical scales form two broader indexes: The Behavioral Regulation Index (BRI) and the Metacognition Index (MI) and an overall summary score, the Global Executive Composal (GEC).

The following is a description of the scales, indices and overall score according to the application manual:

- 1. Inhibit measures the respondent's inhibitory control, is the ability to resist impulses and the ability to stop one's own behavior at the appropriate time.
- 2. Shift is the ability to make transitions, tolerate change and move freely from one situation, activity or aspect of a problem to another.
- 3. Emotional control reflects the influence of the executive functions on the expression and regulation of one's emotion.
- 4. Self-monitor measures a personal self-monitoring function-the extent to which the adult keeps track of his or her own behavior and the effect on others.
- 5. Initiate scale contains items relating to beginning a task or activity and to independently generating ideas, responses, or problem solving strategies.
- 6. Working-Memory measures the respondent's capacity to actively hold information in mind for the purpose of completing a task or generating a response.
- 7. Plan/organize measures the adult's ability to manage current and future-oriented task demands within the situational context.
- 8. Task monitor measures a problem-solving, task-oriented, monitoring function to the extent to which the individual keeps track of their own problem solving success or failure.
- 9. Organization of materials places a greater emphasis on the cognitive task-oriented aspects of organization, measures organization in the adult's everyday environment with respect to orderliness of work, living and storage spaces.

#### The Indexes and the Global Executive Composite

Behavioral Regulation Index (BRI), represents the adult's ability to maintain appropriate regulatory control of his or her behavior and emotional responses.

Metacognition Index (MI), represents the individual's ability to systematically solve problems via planning and organization while sustaining these task-completion efforts in active working memory.

Global Executive Composite is a summary score that incorporates all of the clinical scales of the BRIEF-A.

Table 1 describes the indicators for the interpretation of the results obtained in BRIEF-A, where a high score means difficulties in executive function.

T Score Range	Interpretation
65 or higher	Suggests a high level of difficulty in the specific area, potentially indicating issues with executive functioning.
Below 65	Indicates a more adaptive or normative level of functioning.

#### Table 1: Interpretation of T-scores in BRIEF-A

Basuela (2016) studied the internal consistency of the Spanish version of the BRIEF-A, concluding that it is "valid and reliable for the assessment of executive functions in adulthood" showing correspondence with the original version of the instrument. In the study they found a high internal consistency (Cronbach's  $\alpha = 0.841$ ).

This part of the study presents analysis and interpretation of the data of the study from the consolidated results of the pre-test.

The results of the pilot test applied to 71 university students are presented below. Beginning with the descriptive statistics and general data of the participants (Table 2), the average age was 18.74 years, indicating that most of them are beginning their university studies.

Fifty-five percent of the participants were male and 43% were female.

ruele 2. 2 esemptive Studieles and Gender		
Age		
Mean	18.74	
Std. Deviation	1.024	
Minimum	18	
Maximum	23	
Genre		
Fluid gender	1%	
Prefer no to answer	1%	
Feminine	43%	
Masculine	55%	

Forty-six percent belonged to a career related to the Business Administration school and 54% were enrolled in an engineering academic program.

ne	Business Administration	46%	
	Engineering	54%	

Table 3: Type of Academic Program Enrolled

The results obtained indicate a solid functional performance in the evaluated areas. The BRI and MI indexes present values that reflect balanced functional abilities in behavioral regulation and metacognition. Likewise, the global index of executive functions (GEC) reached a positive overall level in the management of these abilities. This suggests that students have adequate competencies to regulate their behaviors, plan and solve problems effectively. Overall, the results show a good level of development in the executive functions evaluated.



Figure 1: Distribution of Index Scores and Overall Score. BRI-MI-GEC

Figure 1 shows the values of BRI, MI and GEC in terms of their quartiles. In general, the three series have similar medians, with values between 57 and 65, indicating a comparable distribution. MI (red) has the lowest overall dispersion, with a range between 39 and 82. GEC (green) shows an interquartile range similar to that of BRI, but its lower limit reaches 40, and its maximum value is 88.

Another of the findings is that there are skills where 34% of students obtained scores considered significantly deficient in executive function, these were Initiate and Inhibit. They have difficulties in controlling impulses and inappropriate behaviors, as well as less developed ability to initiate tasks, followed by Plan/Organize and Working Memory with 31% and 30% respectively.

94% of the participants have developed the task monitor's ability to supervise tasks and identify errors.



Figure 2: Frequency of Students With Compromised Executive Functions, Considered With Difficulties

#### Conclusions

According to the results obtained, students present a functional level in executive functions, which could be interpreted as a reflection of an adequate integration of the executive components, as proposed by Miyake's theory (2000). This model is used to explain individual differences in areas such as academic performance, emotion management and adaptation to new cognitive demands.

In the study conducted by Bylieva et. al (2021) they found that students have lower scores in the areas of goal setting and time management, which correspond to the Plan/organize scale where 30% of the participants present deficiencies.

Having this information at the beginning of the academic program provides an opportunity to create follow-up programs and favor the development of skills that have been identified as deficient. On the other hand, taking advantage of the normal level of functioning of the executive functions for the achievement of academic success. This study will continue with the application of an instrument that evaluates self-regulation strategies in educational contexts.

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#### Teaching Data Analytics in Higher Education: The Benefits and Pitfalls of Learning Analytics

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#### Abstract

Modern organizations build their competitive advantage on digital technologies and possibilities provided by data. To succeed in this kind of modern work life, students need various digital skills, including contemporary data analytics skills. Especially there is lack of innovative learning environments and different kinds of hands-on experiences that would transform the teaching of statistics and data analytics towards more applied and critical approaches, favoring the humanistic thinking of students. Learning analytics data can be used to enhance the learning of the students and to produce automatic feedback and adaptive tasks to guide the students in the right direction. With the help of data, the teacher deepens the understanding of the learner's experience and develops teaching. In this paper, the challenges of teaching technical content, such as data analytics, in online course environment are studied. The special interest is to study how learning analytics can be used in teaching technical content for student for pedagogical development. The aim is to provide understanding both on the benefits and the pitfalls, and to develop potential solutions to overcome the challenges. The analysis of the usefulness of learning analytics is carried out from the teachers' perspective. Learning analytics experiences from two online data analytics courses are gathered in the form of teacher interviews. In the end of the paper, guidelines for developing data sources for learning analytics for online environments are provided.

Keywords: Learning Analytics, Data Sources, Data Analytics Teaching, Online Teaching

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#### Introduction

Modern organizations build their competitive advantage on digital technologies and possibilities provided by data. To succeed in this kind of modern work life, students need various digital skills, including contemporary data analytics skills. Therefore, it is crucial to teach relevant methods, approaches, and tools for students to achieve contemporary skills for data analytics, but previous literature highlights several challenges that the educators face in teaching data analytics. Especially there is lack of innovative learning environments and different kinds of hands-on experiences that would transform the teaching of statistics and data analytics towards more applied and critical approaches, favoring the humanistic thinking of students.

Innovative learning environments offer also the possibility to apply learning analytics to enhance the learning process of the students (Sharif & Atif, 2024). Examining and measuring the data collected on learning platforms is learning analytics. Learning analytics includes various activities that help the teacher to support learning and optimize the learning environment. These activities include e.g. collecting, analyzing and reporting the learning data. Learning analytics data can be used to support the student and produce automatic feedback and adaptive tasks to guide the student in the right direction. Based on the data, the teacher is able to deepen the understanding of the learner's experience and develop teaching. The digital footprints of student activities left on learning platforms open the learning process and help monitor and analyze it in automatically. In this way the teacher can free up time for personal interaction with the student (Elias, 2011). However, previous literature has identified several different kinds of challenges faced in the adoption of learning analytics to teaching in higher education (Alzahrani et al., 2023; Gibson & Ifenthaler, 2020; Ferguson, 2012). To take the advantage of learning analytics in teaching technically demanding context such as data analytics, more empirically grounded information on practical trials is needed (see e.g. Wong, 2017).

In this paper, the challenges of teaching technical content, such as data analytics, in online course environment are studied. The special interest is to study how learning analytics can be used in teaching technical content for student for pedagogical development. The aim is to provide understanding both on the benefits and the pitfalls, and to develop potential solutions to overcome the challenges. The analysis of the usefulness of learning analytics is carried out from the teachers' perspective. Learning analytics experiences from two online data analytics courses are gathered in the form of teacher interviews.

#### Theoretical Background: What Are the Key Data Sources for Learning Analytics?

Learning analytics relies on various data sources to provide insights into student learning and optimize learning environments. The typical data sources for learning analytics include institutional datasets, digital traces, learning environment systems, Experience API (xAPI), and educational data specifications. Historically, learning analytics has relied on institutional datasets gathered from learning environment systems and registration data (Prinsloo et al., 2023). Digital traces that the various learning activities leave, such as log data, given answers, or source code, are nowadays valuable sources for learning analytics (Steinmaurer, 2021; Hoel & Chen, 2020).

Learning environment systems provide a wealth of data that is invaluable for learning analytics. One key type of data is completion rates, which show whether learners are

completing courses and how long it takes them to finish each task or module. This data helps in assessing the effectiveness of the eLearning course (Prinsloo et al., 2023). Learner performance and progress data includes information on how learners are performing in various tasks and their progress through the course. This data can highlight areas where learners are excelling or struggling, allowing for targeted interventions (Steinmaurer, 2021). Assessment scores from quizzes, tests, and other assessments provide measurable data on learner understanding and performance. This kind of learning data could help to identify both the weak and strong points of the student and to personalize further learning activities (Hoel & Chen, 2020).

Engagement metrics include data on how learners interact with the learning environment system, such as login frequency, time spent on different activities, and participation in discussion forums. These metrics provide insights into learner engagement and motivation (Wibawa et al., 2021). Digital traces, such as log data, answers given, and other digital footprints left by learners as they interact with the learning environment system, can be analyzed to understand learning behaviors and patterns (Steinmaurer, 2021). Interaction data includes information on interactions with other learning environment system features, such as discussion forums, peer reviews, and collaborative projects. This data provides insights into social learning and peer engagement (Hoel & Chen, 2020). Finally, search terms used by learners within the learning environment system can indicate areas of interest or confusion, helping to refine content and resources (Wibawa et al., 2021).

By leveraging these data points, educators and administrators can deepen their knowledge of the learning process, pinpoint areas that should be developed, and further, create more effective and personalized learning experiences. Survey responses from learners offer direct insights into their experiences and satisfaction with the course. This qualitative data is crucial for understanding the learner's perspective and improving course design (Prinsloo et al., 2023).

The use of a common standard like Experience API to gather activity data of the learning from multiple sources can facilitate data integration for learning analytics (Samuelsen et al., 2019, 2021). Furthermore, challenges such as data sharing, interoperability, and ethical implications need to be addressed to effectively utilize these data sources for learning analytics.

#### **Research Methods and Data Sources**

Learning analytics experiences from two online data analytics courses were gathered in the form of teacher interviews. Thus, the analysis of the usefulness of learning analytics is carried out from the teachers' perspective. These two courses were provided by South-Eastern Finland University of Applied Sciences, as part of a larger Knowledge-based management and data analytics open university curriculum provided as cooperation between three Finnish universities of applied sciences. This 25 credit unit curriculum included altogether six courses:

- Knowledge Management goals, 5 credit units (provided by Lapland University of Applied Sciences)
- Data-driven operations and development, 5 credit units (provided by Lapland University of Applied Sciences)
- Data analytics of management with information, 5 credit units (provided by South-Eastern Finland University of Applied Sciences)

- Tools and methods for data analysis, 5 credit units (provided by South-Eastern Finland University of Applied Sciences)
- Information management in organizations, 5 credit units (provided by Karelia University of Applied Sciences)
- Information Economy, 5 credit units (provided by Karelia University of Applied Sciences)

In this paper, the focus is on the two data analytics courses "Data analytics of management with information" and "Tools and methods for data analysis", provided by South-Eastern Finland University of Applied Sciences and the learning analytics used in these two courses. These two data analytics courses included a lot of technical content, such as SQL and R language, use of the Power BI program, and infographics. Thus, they were rather demanding for the students, but also offered many kinds of possibilities to include learning analytics solutions and to try automation of the course assignments. This makes these two courses interesting to study from the viewpoint of learning analytics.

The qualitative interviews focused on the use of learning analytics in these two online courses of data analytics, discussing available analytics, their benefits, challenges, and suggestions for improvement. Interview questions are presented in Table 1.

Table 1: Interview Q	Questions for the Teachers
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Interview questions for the teachers
What kind of learning analytics was available for these courses and what could have been
available?
What should have been done differently in these courses in the use of learning analytics?
What does it take to utilize learning analytics in any course?
Based on your experience, what are the benefits of learning analytics for teachers? What benefits
do you see learning analytics for students?
How to share learning analytics results with students
a) during the course, b) after the course
What does the teacher do after receiving the results, and how could the results be used sensibly?
What data sources of the following a) SQL queries b) Panopto c) questionnaires d) Moodle have
you used in these courses? What other possible data sources could be used?
On what basis did you choose these data sources?
Tell us about each data source you use
- How have you used the information?
- How do you assess the reliability of data?
- How easily data has been available?
- What were the challenges?
- How useful it has been / what kinds of benefits you have gained as a teacher?
What would your dream learning analytics be like?

According to the interviews, the main data sources for learning analytics during these online courses were Moodle, Panopto, the SQL server and the student feedback surveys. Below we have a brief introduction to these data sources, but the key findings are presented in the next section.

Moodle is an open-source learning management system used in the above-mentioned online data analytics courses. In generally, it is commonly used learning management system, at least in Finland. On the Moodle platform of a course, a teacher can, for instance, share
documents and videos. In addition, it is possible to add assignments, exams and conversation areas for students there.

Panopto is a platform for creating and storing videos. Utilizing Panopto it is possible to get data on students' viewing activity concerning shared videos. This is important since videos are a key part of the online courses. Data on the SQL server is obtained only in the special case where students use SQL program language. More precisely, the data on SQL queries (made by students in Azure Data Studio) was collected from Azure SQL server. The student feedback surveys collecting basic information on students' opinions about the courses were conducted at the end of the courses.

#### **Key Empirical Findings**

Following Table 2 summarizes the main themes and insights from the interviews, highlighting the importance of structured planning and effective use of learning analytics in higher education.

Data source	Useful information	Data reliability	Challenges	Benefits
Moodle	Basic information such as when students are on the platform, what they are doing there and for how long You can follow the progress of the ready-made process. How many people actually do tasks and how the number develops over time The exams already provide quite detailed information about the competence of individual students in the exam	Data reliable and available without doing anything yourself	Do-it-yourself analytics in Moodle is quite laborious Requires time from the teacher to dig into this information It only looks at activity that has taken place in Moodle, thus it doesn't tell how much time student has spent in total in doing the course	Familiar tool for many teachers, so there is no need to learn new things Includes basic analytics

## Table 2: Key Findings From the Teacher Interviews

Panopto	Information on the number of views of the videos and the time spent on them	The data itself is reliable, with some limitations to be taken into account	It only offers the results of all students' viewing in aggregate form if teacher does not use Panopto's log to open up the viewing of individual students' videos Videos can technically be viewed by all students, regardless of whether they are on the course or not -> affects the aggregated data	Panopto already has basic analytics
SQL server	Analytics examines the correctness of the syntax of the sentence written by the student	The SQL server collects the data correctly, there are no errors	Does not in itself reveal whether the answer is logically correct	Potential to build functional analytics around the data source, which would quite effectively monitor the training Students also has access to the correct answer to the SQL statement so that they could check more than just the correctness of the syntax
Student feedback surveys	Student perceptions on the course and its implementation etc If open questions included, may provide useful development ideas	The data is as reliable as it usually is in surveys Limitations related to the sample size - it is not worth drawing very far-reaching conclusions from the results	Too extensive questions may decrease the amount of answers The usefulness of a feedback survey largely depends on how successful the questions are In an open answer, the comment is always an individual person, so what is its weight for a teacher to develop the course	The feedback is available to the teacher almost without their own input especially if there are ready made survey questions provided by the organization

As seen from Table 2, learning analytics data was primarily collected from the Moodle platform, which tracked student activity within it. Video engagement was monitored through Panopto; however, the lack of mandatory logins led to potential inaccuracies in identifying viewers. Additionally, SQL server logs provided insights into student interactions with course materials.

For teachers, learning analytics assist in course development by identifying content that is either ineffective or overly challenging. For students, these analytics offer insights into their progress, helping them understand what is required to achieve their desired grades. The absence of clear goals for the use of analytics resulted in vague implementations. Concerns regarding data protection limited the ability to combine various data sources, preventing a comprehensive view of student performance. Furthermore, the reliance on Moodle's analytics, which only capture in-platform activities, may not accurately reflect overall student engagement.

It is recommended to establish clear objectives for what the analytics should achieve before course implementation. Incorporating real-time analytics would allow for timely interventions and adjustments. Additionally, enhancing the communication of analytics results to students by focusing on actionable insights rather than overwhelming data would be beneficial. The ideal learning analytics system would provide real-time feedback and actionable insights for both students and teachers, thereby enhancing the learning experience and the effectiveness of the course.

## **Conclusions and Discussion**

In this paper, the interest was to study how learning analytics can be used in the courses of data analytics utilizing Power BI, the R and SQL program languages. We focused on the data sources. The aim was to provide understanding both on the benefits and challenges of the data sources in the sense of learning analytics. The analysis of the usefulness was carried out from the teachers' perspective. Furthermore, we focused on data and data sources, but it is important to utilize results in future, and measure how the changes made effect. In the best case, this would lead to a continuous process.

There is no doubt that learning analytics can bring several benefits that help the teachers to develop their teaching processes and support the students in their learning process. However, to really succeed in harnessing learning analytics for value creation in higher education, the higher education institutes should encourage teachers to adopt learning analytics through strategic approach. Thorough strategic approach the higher education institutions could create an environment where teachers feel empowered and motivated to utilize learning analytics, ultimately enhancing the educational experience for both educators and students. In next, some guidelines for this kind of strategic approach are presented.

Firstly, establishing of clear objectives for how learning analytics will enhance teaching and learning outcomes is crucial. Communicating the benefits of learning analytics by highlighting success stories and data showing improved student performance linked to analytics use can further support this vision. Secondly, by encouraging collaboration among teachers by creating communities of practice where they can share experiences and best practices is essential. Recognizing and rewarding teachers who effectively integrate analytics into their teaching can also foster a supportive culture. Additionally, peer mentoring can be implemented by pairing experienced users with those new to analytics for hands-on guidance.

Thirdly, regular training sessions, such as workshops and seminars, should be organized to familiarize teachers with analytics tools and their benefits. Fourthly, it is important to ensure that teachers have enough resources and also access to relevant software tools for effective analytics. Offering ongoing technical support to resolve any issues quickly can further facilitate the use of learning analytics by providing user-friendly analytics platforms that are easy to navigate is important.

In overall, teachers should be encouraged to consider analytics already during the course design phase to align teaching strategies with data insights. Also, addressing concerns about data security and privacy can help to build trust in using analytics. In future research it would be beneficial to study in more detail how teachers could apply the available learning analytics data and data sources in more effective way and how to better consider the students' point of view of learning analytics. These studies would need more empirical data gathered not only from teachers but also from students.

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## Teaching Technical Content in Higher Education: A Comparative Analysis of Two Different Teaching Approaches

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#### Abstract

Modern technology, such as automation and learning analytics, can positively impact education by enhancing opportunities for both teachers and students, promoting self-reliant learning, and improving the efficiency of the teaching process. However, earlier studies have also found that there are many teachers who are not eager to adopt new technologies in their teaching for various reasons, such as fear of unsuccess of trials or lack of capabilities to integrate tools into the teaching. In this paper, we are interested to study whether automation of teaching will provide benefits or not. We aim to provide an analysis of teaching technical content in automatized manner in higher education through a comparative case study. The case study includes Power BI teaching in two ways, the classical way and the automated way.

Keywords: Higher Education, Business Intelligence, Online Teaching, Automated Teaching, Learning Analytics

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#### Introduction

Due to fast technological development and digitalization, the current educational processes in higher education institutions emphasize the need for innovative ways to organize teaching. For example, teaching of demanding technical content for students can benefit from automation. Previous studies have suggested that automation can positively impact education by enhancing opportunities for both teachers and students, promoting autonomous learning, and improving the efficiency of the teaching process. However, earlier studies have also found that there are many teachers who are not ready to accept and adopt new technologies in their teaching for various reasons, such as fear of unsuccess of trials, lack of capabilities to integrate tools into the teaching, and lack of motivation or resources.

In this paper, we aim to provide a realistic picture of teaching technical content in an automatized manner in higher education through a comparative case study. The case study includes Power BI teaching in two ways, the classical way and the automated way. The classical way includes learning materials, lecture videos and traditional assignment, and the automated way includes specific training videos and automated teaching through virtual exam that has questions both about the training processes and the results. Through this case study the paper provides answers to the following research questions: 1) How does students' studying differ in the two comparable ways? and 2) Is automation possible in the light of the study results?

#### **Theoretical Background**

New technologies are nowadays integrated more into teaching practices to enrich instructional strategies and improve the quality of teaching and learning (Hatamleh & Hatamleh, 2024; Lee, 2018). There are several motivational factors behind this trend, but according to previous studies teachers are motivated to use emerging technologies in teaching especially due to pedagogical and pragmatic reasons, such as desire to gain more efficiency in teaching, and due to external imperatives, such as the demands caused by the development of technology and knowledge-oriented economy and recruiting organizations (Backhouse, 2013).

Even though expectations in new technologies for educational purposes are high (Wong, 2013), there are both negative sides and positive sides related to the trend of integrating technology in teaching. In overall, the benefits of integrating technology into education are rather widely recognized, leading to efficiency and improved education quality (Frank, 2006; Hatamleh & Hatamleh, 2024). A rather recent study of higher education students found that the implementation of technologies in class encouraged engagement especially in constructive and activity demanding activities, and in this way was positively impacting learning outcomes (Wekerle et al., 2022). Furthermore, the use of different kinds of education technology in higher education settings equips teachers with innovative tools, enriching students' learning subjects (Urban, 2015). In the light of this, teaching of technically demanding content such as Power BI could benefit from automation through modern technology.

However, there are also challenges, such as the need for technical skill acquisition of the teachers (Frank, 2006; Hatamleh & Hatamleh, 2024). Challenges in integrating technology into teaching exist also purely due to the lack of access to relevant technologies (Bećirović,

2023; Wong, 2013). Furthermore, as new technologies have revolutionized educational practices, they also challenge the traditional roles of teachers and students (del Carmen, 2013). It is also noteworthy that the use of technology in education raises also ethical issues related to teachers, students, schools, and software companies (Akcay, 2008) that need to be considered when developing and implementing these technologies.

To overcome the different kinds of challenges, various types of professional development programs have been suggested to improve teachers' pedagogical understanding and the integration of innovative approaches into their teaching practices (Hanewald, 2014). As the successful use of technology in the classroom depends primarily on teachers, professional training should be provided to enhance their competence and confidence in integrating modern technology into teaching.

In conclusion, the integration of new technologies in teaching has shown promising results in enhancing the teaching-learning process, motivating educators, and improving the quality of education. Technology-supported environments for personalized learning aim to create a functional learning environment for the student, tailoring instruction to meet individual needs (O'Donoghue, 2009). However, challenges such as technical skill acquisition need to be addressed to fully leverage the benefits of technology in education. Challenges in integrating new technologies into teaching include many things, such as need for support, motivation, relevant know-how and capabilities, and access to necessary tools (Bećirović, 2023).

# **Comparative Case Study**

In order to analyze how technology integration into teaching affect the students and the learning outcomes, we carried out a comparative case study. We taught Power BI, a business intelligence tool offered by Microsoft as a desktop program and a cloud service, with which business information can be collected, analyzed and reported as interactive visualizations, to our higher education students in two different ways – the classical and the automated way. In following Figure 1 the key issues of these two pedagogical ways are summarized.

#### Automated teaching and assessment

Videos on creating a Power BI visuals (20 videos, total duration 390min)  $\rightarrow$  Based on the guidance of the videos, student practices data visualization

Automated exam with 20 multiple-choice questions, the answer to which can be found during the process and by analyzing the given data using the created Power BI report  $\rightarrow$  as a Moodle exam

No mandatory, returned exercises

#### Classical teaching and assessment

The course is consisted of Power Point slides and example visualizations

Videos on creating a Power BI visual (7 videos, total duration 66min)

Assignment in which the given Excel table had to be visualized  $\rightarrow$  is evaluated from the point of view of data analysis and visualization of the output data (requires teacher evaluation)

Assignment: one mandatory exercise to be returned

# Figure 1: Teaching of Power BI in Two Ways

Total length of the videos in classical teaching course was 66min and in automated teaching it was 390min. Number of students in the classical teaching course was 64 and in the automatic course was 36.

The task to be evaluated in classical teaching was an assignment in which you had to create your own visualization of the given data. In automated teaching, assessment with a Moodle exam, where the correct answers to the statements can be found in the data provided using Power BI. In automated teaching, tasks are divided into small parts, so there is no need to manage the whole at the same time or create your own solutions "from scratch".

When automating teaching, it is not possible to commission a larger task in which the student should build and develop their own solution to a given problem.

## **Key Empirical Findings**

The learning analytics data of these two courses enables us to analyze how does students' studying differ in classical and in automated ways. The data reveals for example how much time each student spend in watching videos in these two varying course implementations. In automated teaching, videos were watched more at the end of the course. The peak of the classical teaching was placed just before the return of the training work, but viewing was not so clearly focused towards the end of the course.

If we look more carefully the video viewing in relation to the total number of videos and the number of students (as a percentage), classical education looks at a higher proportion of the total video offering. Proportionating is needed in order to take into account the different number of students and the length of the videos. See the Figures 2 and 3.



Figure 2: Video Watching Time in Classical Teaching, Watch Time in Minutes on the Left and Relative to Total Video Supply and Number of Students (percent) on the Right



Figure 3: Video Watching Time in Automated Teaching, Watch Time in Minutes on the Left and Relative to Total Video Supply and Number of Students (percent) on the Right

In the classical teaching course, videos had a clear role to play in providing basic information, and after that, the assignment was carried out as independent work. In the beginning of the automated teaching course, the videos were related to hands-on activities and that's why they were mainly watched while the students were actually making the exercises. Furthermore, traditional teaching course videos were clear lecture videos, and the videos of the automated teaching course were more like wondering type of videos recorded as one take, where the teacher himself opened the data being processed for the first time and started thinking about what could be made of it and how. So at least if the students had basic skills of PowerBI, they were able to skip the video and at least watch most of the time at double speed. In other words, this partly explains the relatively small number of views and the emphasis on viewing towards the end of the automated teaching course.

The popularity of videos obviously varies according to the perceived importance of the student. This explains the high variety and in overall, there is no clear most interesting video in either of the teaching methods (see Figure 4).



Figure 4: Relative Watch Times of Videos: In Left Classical Teaching course and In Right Automated Teaching Course

When more carefully analyzing the views of the videos on a video-by-video basis, the results show more variation (see Figure 5). In the following figures some of the video names/topics are in their original language (Finnish) as they were in the original system were the videos were provided for the Finnish students.

Video	Duration	Minutes Delivered	Sessions	Average Viewing Time	Average Viewing Time per Viewer
Power BI Desktop - 1. Datan lataaminen ohjelmaan	5,15	350,15	85	4,12	6,48
Power BI Desktop - 2. Ympyräkaavio	11,37	678,43	71	9,56	12,80
Power BI Desktop - 3. Pylväskaavio	14,37	705,68	62	11,38	16,04
Power BI Desktop - 4. Kaavion muodostuminen	7,23	370,16	67	5,52	8,61
Power BI Desktop - 5. Kaaviotyypit	9,05	544,72	69	7,89	11,59
Power BI Online - 1. Power BI-raportin julkaiseminen pilveen	9,90	365,60	52	7,03	10,16
Power BI Online - 2. Kaavion luominen	9,27	224,12	35	6,40	7,47
Total		3 238,86	441	7,34	51,41

Figure 5: Classical Teaching Course Video Viewing (Total Watch Time, Views, View Duration, Student Watch Time)

Video	Duration	Minutes Delivered	Sessions	Average Viewing Time	Average Viewing Time per Viewer
tietokantaraportin tietomallinnus	51,58	957,21	58	16,50	30,88
Tuotavien tietojen valinta ja muokkaus	42,47	1 139,48	64	17,80	31,65
Kyselyraportin laadinta	40,47	748,94	47	15,93	25,83
Tietokantaraportin viimeistely	31,87	497,70	39	12,76	19,91
Kyselyraportin tietomallinnus	27,80	602,13	47	12,81	20,07
Tietomallin luominen	26,23	547,64	29	18,88	23,81
Tiedon visualisointi	21,85	245,82	18	13,66	15,36
ETL	17,93	427,79	36	11,88	16,45
direct query	15,97	299,15	33	9,07	13,01
Yhteyden luominen kyselyn tuloksiin	15,53	350,33	38	9,22	13,47
Tervetuloa	15,03	448,39	48	9,34	14,01
Kyselyraportin julkaisu ja ylläpito	14,70	196,14	23	8,53	10,32
Myyntidatan tietomallinnus	13,72	416,37	49	8,50	12,25
Yhteyden avaaminen tietokantaan	10,60	420,68	62	6,79	10,79
Tietomallinnus - DAX	10,43	151,61	19	7,98	8,42
Kyselyltä tulevan datan muokkaus	9,63	227,04	41	5,54	8,41
Raportin luominen kyselyn pohjalta	9,08	199,44	28	7,12	8,67
kyselyn luominen osa1	6,22	180,59	36	5,02	6,69
kyselyn luominen osa2	5,48	157,68	32	4,93	6,31
Paikallisen tiedoston käyttö	3,43	44,29	14	3,16	4,43
Total		8 258,40	761	10,85	168,54

#### Figure 6: Automated Teaching Course Video Reviewing (Total Watch Time, Views, View Duration, Student Watch Time)

When looking at the viewing of individual videos by calculating the watch time of the video in relation to the total number of videos and the number of students, it can be seen that in automatic teaching course individual videos were viewed relatively less than in classical (see Figures 7 and 8 below). The sum of the percentages is not 100, because it is proportional to the number obtained if all students completely watch all the videos.



Figure 7: Watch Time Relative to Total Supply of the Videos and the Number of Students, Classical Education (y-axis=video watch time as a percentage of the product of total video supply and number of students)



Figure 8: Watch Time Relative to Total Supply of the Videos and the Number of Students, Automatic Instruction (y-axis=video watch time as a percentage of the result of total video supply and number of students)

There are big differences in how students watched videos (see Figures 9 and 10 below). In classical teaching, a larger share of the total number of the videos was looked through than in automated teaching on a student-by-student basis. In automated teaching, there was only one student who watched all the videos completely. So the number of videos doesn't have to be huge in automated teaching neither in terms of number or total duration of the videos.

Student	Videos Viewed	Count of Sessios	Minutes Delivered	Viewing Time %
1d901c72-7a91-4ac3-8e25-b0bc01356d47	7	19	102,30	154,99
336a73f5-94fb-4cd7-b0b9-b0b10094e6cc	7	8	76,33	115,66
391cbf86-c254-425f-a0af-b0d900a49016	7	7	73,89	111,95
537d1d85-123f-4dec-a479-b0b101343673	7	10	80,13	121,40
556a7ce4-6915-42e0-bd82-b0b10141ac3d	7	20	118,15	179,01
56f932e1-1e59-464d-bde1-b0ad00a8e31c	7	8	80,22	121,54
56fa894a-118c-4da5-929d-b0ab0104f37b	7	7	73,63	111,57
60565201-bc79-48a4-addf-b0ae009bfc94	7	15	45,96	69,64
75088ffb-7cec-44c7-b9a2-b0d801331d56	7	11	68,88	104,37
82e849a1-7493-49d6-b909-b0bf00b541ea	7	7	31,87	48,29
9bb06043-e55d-45a1-b597-b0ad009344b8	7	10	68,55	103,86
9d892c89-5076-44b9-8640-b0af005a00c4	7	8	52,07	78,90
a0361551-19d8-4962-af2d-b0b200cbd698	7	29	162,15	245,68
a8d037e4-8905-43e2-ac20-b0cc00c9bd76	7	11	85,59	129,68
ae4d92e4-1d8a-484a-a1c9-b0e300d422e4	7	7	66,34	100,52
af98321a-860a-4fc4-b4c8-b0c001003e2c	7	7	66,34	100,51
b0a3fb22-6658-4329-b232-b0b000d61735	7	7	59,12	89,58
b3d1e793-17a6-4942-bb83-b0d300c8ed24	7	7	66,34	100,52
b8dd2f3b-8afb-40f8-8a1e-b0ac00f2ebc9	7	9	82,29	124,69
d8b45808-110d-4d9a-91fd-afbd010544e5	7	14	104,95	159,02
e379461c-e4ed-4b77-b7de-b0cb0115ae02	7	14	159,94	242,33
51cb822e-32b3-4a3c-b133-b0d10119beac	6	7	58,01	87,89

Figure 9: Watching of Videos in Classical Education (cookie, how many different videos were watched (max 7), how many views, total viewing time in minutes, percentage of all videos viewed)

Student	Videos Viewed	Count of Sessios	Minutes Delivered	Viewing Time %
56fa894a-118c-4da5-929d-b0ab0104f37b	19	21	341,94	87,68
8af6c152-16e3-4e35-99ed-b10700e70b87	19	29	309,80	79,44
a8d037e4-8905-43e2-ac20-b0cc00c9bd76	19	26	276,47	70,89
d235f6d9-5077-4ba8-9d89-b130015f26f3	18	26	362,40	92,92
8bde619f-137a-43b1-a332-b12a00d64f0a	17	25	176,12	45,16
9bb06043-e55d-45a1-b597-b0ad009344b8	17	40	301,21	77,23
f4110651-ca37-47cf-8cdc-b12d00d51fba	17	38	233,22	59,80
0fe0406e-db98-401b-827d-b12f0134f0fa	16	28	188,59	48,36
23adf547-3e0d-43d3-8c46-b0c7007fd72f	16	24	515,45	132,17
8ec7d57d-fb7c-49f9-8ff2-b0bd00b792ae	16	22	204,59	52,46
9637725c-950b-4319-a37d-b14b00cb478d	16	5 18	218,47	56,02
77b0f20b-ab8c-4ecb-a3c4-b0ac006227c9	15	26	332,25	85,19
82e849a1-7493-49d6-b909-b0bf00b541ea	15	20	208,51	53,46
9d892c89-5076-44b9-8640-b0af005a00c4	15	20	227,12	58,24
a2184330-0d66-4246-b787-b0b201429096	14	27	192,38	49,33
b8dd2f3b-8afb-40f8-8a1e-b0ac00f2ebc9	14	17	187,79	48,15
36317441-63aa-4029-8b2c-b14300c63e2f	13	16	329,63	84,52
556a7ce4-6915-42e0-bd82-b0b10141ac3d	13	14	134,56	34,50
c9ac18cd-399d-4d15-9897-b10c016effa6	13	29	197,73	50,70
e5d46b18-a144-467c-8cc4-b1360146e00c	13	13	173,33	44,44
f9ac5868-d617-45bf-9f78-b1280060ff9c	13	23	214,65	55,04

Figure 10: Watching of Videos in Automated Teaching (cookie, how many different videos were viewed (max 20), how many views, total viewing time in minutes, percentage of all videos viewed)

When we analyze the measured learning outcomes of these two course types, we are able to answer to the second research question: Is automation of teaching successful in the light of the results?

When comparing the scores obtained for the assignment in classical teaching with the scores obtained in automatic teaching, the results are shown in following Table 1.

Table 1: Learning Outcomes in Classical Teaching and in Automated Teaching					
Max 20 points	Classical teaching	Automatic teaching			
Average performance score	17,66	14,98			
Average score max. Points	88%	75%			
Passed students (relative to	100%	80%			
number of students that					
viewed course videos)					

Although the scores are not directly comparable due to the difference in assessment tasks, it is easier to get a good grade in classical teaching, both based on the number of points and the number of graduates.

Since in the classical teaching course the assessment was based on a given assignment, you could easily do the assignment without getting to know the lectures any further, if you already had previous Power BI skills. Or you could order it from someone who knew how to do it. It is interesting that altogether 63 students had watched the videos in the classical teaching course and 64 completed the course.

In automated teaching course, student needed to watch the videos in order to be able to produce a report with some of the exam answers. Some of the questions were related to the processing of the problem at hand and a few were more general. The questions for the exam were drawn from a set of questions. There were three attempts with a forced 24h break in between. There were a lot of questions in the exam that had to be given a number or text answer, so guessing was not enough. Of course, correct answers, and, also ready-made Power BI files, could have been shared in some forum to other students. However, judging by the exam results, not very much was done in this way, luckily.

In the future in the automated teaching course, teacher could think about whether the answers could be personalized somehow. That is, the student would have to enter their date of birth in some Power BI question and that information would also be known in the Moodle exam.

# Conclusions

In this paper we have studied the deployment of technology in teaching by implementing Power BI course in automated way and in less technological way, thus in classical way. Previous studies on technology deployment in teaching have suggested that the use of new technologies in education has significantly impacted student engagement, teaching practices, and personalized learning. While there are challenges in integrating new technologies into teaching, they offer numerous benefits for enhancing student engagement and learning outcomes. However, ethical considerations related to the use of technology in education also need to be carefully addressed. Based on the empirical data, we can conclude that in classical teaching students were returning to the videos near the deadline of the assignment, but in automated learning the majority of videos were viewed according to students' own timetables. Furthermore, taking automated course does not automatically mean guaranteed points for the student. In this case in both courses the students viewed the videos quite actively. But it is important to keep in mind that there has to be a clear reason for the student to view the video. In overall, creating automated course takes more time and needs some planning and technical skills, but has a great pay back during the implementation.

When planning automated teaching, it is necessary to think about how to support not only the learning of the student but also enthusiasm of the student towards to taught subject. If the chosen technical solution is not well taught it can leave to a frustration. This can rather easily happen e.g. in the case of automated programming online courses, where the code has to be entered directly into the evaluation widget. For these, the answer must be given exactly in the required form. So, for example, spaces that have no effect on the operation must be exactly in the same place as in the model solution, and then the student comes across a situation where one thing is asked in the assignment but another in the model answer. This takes quite a lot of student's enthusiasm for studying away, because instead of studying the subject, the student has to struggle with finding exactly the same coding method as in the model solution.

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