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## ***The Effect of Pandemic on Teachers' Emotional State and on Their Attitudes to the Teaching Profession***

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### **Abstract**

Education has been affected by the spread of COVID-19, and schools were closed for almost 2 years in the Czech Republic. During the pandemic, teacher stress has been intensified by distance education as well as by limited access to social support, which might function as a buffer in experiencing stress. The aim of our study was to analyze experience and attitudes of teachers to the online distant teaching during the Covid-19 pandemic and to confront them with the results of their discomfort level. The survey was realized in a group of 492 teachers who exercised their profession during the quarantine. Most teachers reported high level of stress during online teaching due to their effort to offer good performance. Teachers also stated their work involvement required serious and accurate preparation for classes which was time consuming. Results in a standardized inventory showed high level of teacher emotional exhaustion, but did not show higher level in depersonalization and personal accomplishment.

Keywords: Teachers, Emotions, Stress, COVID Pandemic

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## 1 Introduction

People in constant, prolonged, intensive interaction with other people in an emotionally charged atmosphere are susceptible to the syndrome of burnout [6]. Since November 2019, population of the Czech Republic went through different quarantine phases, passing through border closures, social distancing, and the suspension of presential teaching activities overtaken by virtualization. Schools were closed for almost a year which was one of the longest breaks in the EU.

Well-being of most people including teachers was affected in many countries as it was reported by several studies [2,3,5]. In this regard, although efforts have been made to train teachers through online learning platforms, this modal change implied a series of challenges when developed in a hostile, complex and unprecedented context [6]. Experts in clinical psychology expect that it will be necessary to re-develop sustainable work environments and policies, which will provide well-being to teachers in different aspects (social, emotional, physical). This effort will have to be reflected not only in the improvement of their productivity—even in extreme situations, as is the case of job development during the COVID-19 pandemic, it will also help to prevent pathologies associated with the teaching function, such as burnout due to prolonged exposures of stress.

Online teaching transition during COVID-19 school lockdown elicited new situations and challenges for teachers and schools across the globe as remote teaching introduction brought new stressors for teachers. Our own experience inspired us to study feelings and attitudes of teachers towards distant online teaching and possible stressors connected with it (necessity to learn new methods and demands of preparation for distant teaching) and occurrence of the Burnout Syndrome and its specific features within the teacher community. The study was conducted in December 2020 and January 2021.

## 2 Objectives

The aim of our research was to analyze experience and attitudes of teachers to the online distant teaching during the Covid-19 pandemic and to confront them with the results of their discomfort level as measured by the Maslach Burnout Inventory.

## 3 Methods

We used quantitative research method: a questionnaire designed for this purpose was divided into 4 sections (personal data specification, teacher attitudes towards online teaching, teacher opinions on Burnout Syndrome formation and its diagnostics as measured by the standardized Maslach Burnout Inventory. The Maslach Burnout Inventory [4] is the most commonly used instrument for measuring burnout, it captures three dimensions of burnout: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA).

## 4 Research Sample

337 elementary school teachers (92 % female, 8 % male) and 155 secondary school teachers (83 % female, 17 % male) participated in our study. We used the teacher Facebook platform to address potential survey respondents. As seen on Table 1, the age of respondents covered the whole range of productive age, from very young ones (19 % at elementary schools and 8

% at secondary schools) to senior teachers over 60 years (2 % at elementary schools and 6 % at secondary schools).

Age of participants	Elementary school teachers	Secondary school teachers
less than 30 years	19%	8%
31 - 40 years	25%	33%
41 – 50 years	32%	28%
51 - 60 years	21%	25%
more than 60 years	2%	6%

**Table 1: Age of participants**

Variety in teaching experience can be observed in our research sample – from beginning teachers (23% at elementary schools, 14 % at secondary schools to senior teachers with teaching experience over 35 years (4% at elementary schools, 8% at secondary schools), see data on table 2.

Years of teaching experience	Elementary school teachers	Secondary school teachers
less than 5	23%	14%
6-10	18%	20%
11-15	13%	16%
16-25	24%	26%
26-35	18%	16%
35+	4%	8%

**Table 2: Length of teaching experience**

During quarantine and closures, schools in the Czech Republic had to switch to distant online teaching as an emergency measure within a very short period of time. Unfortunately, most teachers got very little training in this regard. Nevertheless, data of Ministry of Education of the Czech Republic confirmed most schools adopted online teaching despite obstacles. This is confirmed in our sample, (see tables 3 and 4).

Use of online teaching during pandemic	Elementary school teachers	Secondary school teachers
yes	94%	96%
partly	5%	4%
no	1%	0%

**Table 3: Use of online teaching during Pandemic**

Use of online teaching during pandemic	Elementary school teachers	Secondary school teachers
yes	5%	6%
partly	5%	12%
no	90%	82%

**Table 4: Previous experience with online teaching**

The swift switch from traditional classrooms to online classes in the wake of COVID-19 has given teachers very little or no time for planning and preparation. Next items of our questionnaire aimed at the teacher feelings about new methodology and demands preparation of distant online teaching put on them (tables 5 - 8). Just 9 % of elementary school teachers were going well with online teaching (13 % of secondary school teachers), most teachers were not happy about it, to a certain extent. Everyday teacher preparation for online teaching was longer than 2 hours in most cases and they were more tired during online teaching than during regular class.

Going down well with online teaching	Elementary school teachers	Secondary school teachers
yes	9%	13%
partly	72%	72%
no	18%	15%
no explicit opinion	1%	0%

**Table 5: Teacher feelings about online teaching**

Time needed for preparation	Elementary school teachers	Secondary school teachers
less than 30 minutes	1%	1%
30 minutes	1%	1%
1 hour	10%	7%
1,5 hours	9%	9%
2 hours	16%	14%
more than 2 hours	63%	68%

**Table 6: Time needed for preparation during pandemic**

Was the preparation for online longer	Elementary school teachers	Secondary school teachers
yes	83%	88%
partly	4%	9%
no	13%	3%

**Table 7: Was the preparation for online teaching longer than for regular class teaching?**

More tired during online teaching	Elementary school teachers	Secondary school teachers
yes	53%	45%
rather yes	26%	30%
rather no	17%	19%
no	4%	6%

**Table 8: Did you feel more tired during online teaching than during regular class?**

Next items of our questionnaire were focused on teacher feelings about risk of being threatened by the Burnout Syndrome. As seen from results of table 9, almost half of the teachers from both samples are afraid of this risk.

Do you think you might get BS?	Elementary school teachers	Secondary school teachers
yes	14%	13%
probably yes	32%	33%
probably no	38%	35%
no	16%	19%

**Table 9: Do you think you are in risk of being threatened by the BS?**

Teachers in our survey were then administered Maslach Burnout Inventory (MBI). The development of the MBI was based on the need for an instrument to assess experienced burnout in a wide range of human service workers. Standardized method includes 22 items and respondents assess every item on a scale 0 – 7 (0-not at all to 7 quite strong) regarding their feelings of exhaustion. The Maslach Burnout Inventory captures three dimensions of burnout: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). The three key dimensions of this response are an overwhelming exhaustion, feelings of cynicism and detachment from the job, and a sense of ineffectiveness and lack of accomplishment.

Score in emotional exhaustion	Elementary school teachers	Secondary school teachers
low	37%	45%
average	27%	20%
high	36%	35%

**Table 10: Teacher Burnout Syndrome – results:**

**a) Score in emotional exhaustion**

As seen from the table 10, 27 % of elementary school teachers performed an average score in the EE and 36 % high score. Their colleagues from secondary school showed similar results especially in high scores – this means more than one third of teachers is threatened by emotional exhaustion, measured by the Maslach BS Inventory.

Score in depersonalization	Elementary school teachers	Secondary school teachers
low	74%	71%
average	18%	22%
high	8%	7%

**Table 11: Teacher Burnout Syndrome – results:****b) Score in depersonalization**

Results in the second dimension are more positive than in the first dimension as 74 % of elementary school teachers and 71 % of secondary school teachers show low level of depersonalization.

Score in personal accomplishment	Elementary school teachers	Secondary school teachers
low	60%	61%
average	29%	23%
high	11%	16%

**Table 12: Teacher Burnout Syndrome – results:****c) Personal accomplishment**

Results in the third dimension are also more positive compared to the first dimension as 60 % of elementary school teachers and 61 % of secondary school teachers had high score in personal accomplishment.

**Research results – summary**

- 1) Distant online teaching: 95 % of elementary school teachers and 96 % of secondary school teachers introduced within a very short time full online classes, the rest of teachers combined online teaching with other methods. 90 % of elementary school teachers and 82 % of secondary school teachers had no previous experience with distant teaching.
- 2) Most teachers did not go down very well with online teaching, but 72 % of elementary school teachers and 78 % of secondary school teachers held the view that online teaching had both positive and negative aspects.
- 3) Most teachers needed lots of self-training to do online teaching well. They felt more exhausted as their preparation for online teaching was much more demanding and time-consuming compared with standard classes.
- 4) Burnout Syndrome was confirmed in the emotional exhaustion dimension (EE), of the Maslach Burnout Inventory (36 % of elementary school teachers, 35 % of secondary school teachers), but not in other two dimensions – depersonalization (DP), (8% of elementary school teachers and 7% of secondary school teachers) and personal accomplishment (PA), (11% of elementary school teachers and 16% of secondary school teachers).



## **Conclusion**

Members of the teaching profession experienced psychological discomfort at the beginning of the 2020–2021 school year. Faced with the situation of COVID-19 pandemic, many teachers were dealing with new measures, situations, sometimes with a lack of clear guidelines. Working from home, using ICT for online teaching created feelings of tension, anxiety and exhaustion of many teachers as proved by our results.

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## ***Creating an Inclusive and Health Promoting Learning Environment in Primary School***

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### **Abstract**

Many students struggle with mental health issues and low motivation in today's school, and the problems often start as early as primary school. Surveys show that children at the age of ten to twelve struggle with loneliness, sadness, low self-esteem, bullying, stress and physical problems. One of five dread going to school. The current study presents an approach that can be applied to facilitate for making the children themselves engaged in creating a safe, health promoting and inclusive learning environment for everyone in primary school. This approach includes five steps, which are identifying 1) what is important, 2) success factors, 3) obstacles, 4) what needs focus and 5) what specifically can be done to change the situation. The students reflect on these questions individually in writing and through discussions in class. In this way, the children themselves find solutions to obstacles under guidance from an adult. Results on evaluations from four fifth grade groups show that of 58 students, 38 felt the method helped them find out what is important, 31 became motivated, 45 managed to follow their own plans, 31 became better at finding solutions, 44 enjoyed more being together in school and 36 liked using the method. We conclude that children in primary school may be engaged in influencing their learning environment and their own situation in a positive direction when teachers facilitate for this.

Keywords: Health Promotion, Motivation, Learning Environment, Inclusion

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## Introduction

Most students in Norwegian primary school report that they experience a positive learning environment, but there are quite a few students who do not share this feeling. In general, there is an increase in mental health issues in Norway (Meld. St. 19, 2018-2019, and about seven percentage of children in school-age have symptoms of mental suffering (Reneflot et al., 2018). Surveys for students aged 10 to 12 years show that quite a few students are being bullied or feel lonely or stressed, and one of five reports dreading going to school (Løvgren & Svagård, 2019). These results are confirmed through surveys for all students in primary school carried out yearly (Udir, n. d.). About 5,9 % of the students are generally being bullied in primary school, and these numbers are quite constant from year to year. Being exposed to bullying may have serious consequences, such as low self-esteem, self-harm, suicidal thoughts, or symptoms of post-traumatic stress (Breivik et al., 2017). It may also have consequences for school-related activities through lack of mastery, low performance and school absence. As the consequences of bullying are very serious, it is important to facilitate for creating inclusive learning environments for students, environments free of bullying. The current study investigates the potential of a systematic approach focused on mastery, participation and motivation, to facilitate for a health-promoting and inclusive learning environment.

According to the Norwegian Education Act (1998 § 9a), every student has the right to a safe and good learning environment that promotes health, well-being, and learning. They have the right to be included and to have a natural place in the school, as well as to feel that they contribute in a meaningful way and participate in forming their own conditions (Meld. St. 6, 2019-2020, p. 11). In health-promoting theory, the aspect of meaningfulness is also emphasised, meaning that one sees the value of one's own contribution, and feel that it is possible to influence situations (Antonovsky, 2012). This is the most important out of three factors that together constitute what Antonovsky (2012) calls a "sense of coherence" (SOC). The other two factors are comprehensibility, meaning that one understands a situation and incidents that occur, and manageability, meaning that one sees one's own resources and believe in having the ability to cope. Having a sense of coherence, contributes to experiencing well-being and good mental health (Braun-Lewensohn et al., 2016; Moksnes et al., 2014), and in school, it supports students to develop resilience to cope with stressful situations (Eriksson & Lindström, 2006). Hence, creating an inclusive and health-promoting learning environment means to facilitate for students to participate in activities they understand and master, as well as letting them influence their own situation in school in meaningful ways.

## Anti-bullying programmes and understandings of bullying

The challenges described in the current study are not new, and there have been several programmes nationally, over years, that have dealt with creating a bullying-free or positive learning environment. The Scandinavian researcher Olweus put anti-bullying research on the agenda, both nationally and internationally, and is known for the *Olweus Bullying Prevention Programme* (2004). Large-scale studies carried out in the late 1990s over four years, showed a significant decrease in bullying (Olweus & Limber, 2012). The programme was also implemented internationally in different contexts (Bauer et al., 2007; Black & Jackson, 2007; Limber et al., 2004; Melton et al., 1998; Pagliocca et al., 2007). Other Norwegian large-scale programmes carried out at the beginning of year 2000, called *Zero* (Roland et al., 2010) and *Respect* (Ertesvåg, 2009; Ertesvåg & Vaaland, 2007), show similar results. All three

programmes represented whole-school-approaches which included measures on school-level, class-level, individual level, and community level.

Clear rules and modification of behaviour through consequences are central elements in all three programmes, which place them within the behavioural-cognitive tradition (Vogt, 2016). Another programme with a more positive focus, called *Positive behaviour, supporting learning environment and collaboration (PALS)*, was implemented during the same period, and this programme also showed some positive results in student behaviour (Arnesen et al., 2003). Even though the programme has a more positive focus, it still builds on some of the same theoretical basis as the anti-bullying programmes, since using rewards to modify and support positive behaviour is a central element. With such strong emphasis on modification of behaviour, the programmes could be said to build on a deterministic view on humans as results of reinforcements and consequences (Johannessen et al., 2010).

The anti-bullying programmes described above all build on Olweus' definition of bullying: "a student is being bullied or victimized when he or she is exposed, repeatedly and over time, to negative actions on the part of one or more students» (Olweus, 2012, p. 11). There is an emphasis of the individual in this understanding, and students are defined as either bullies or victims of bullying. This understanding has been criticised and is generally referred to as the first paradigm within anti-bullying-research (Lund & Helgeland, 2020). In the second paradigm, there is more focus on bullying as social processes, and bullying is described as processes of inclusion and exclusion (Jørgensen, 2019). Bullying represents exclusion for the persons being bullied, and at the same time, there is an inclusion process where some are included in the group bullying others. Sometimes, the boundary between being bullied and being a bully is unclear, as students may be in both categories (Amundsen & Garmannslund, 2020). This is because these social processes of exclusion and inclusion are dynamic, and not constant. If the problem exists in the social processes, the solution to the problem is perhaps also to be found in social processes. This is what is argued in the current study where a five-step approach to mastery, participation and motivation has been implemented to facilitate for engaging students in creating positive social processes in classes.

### **Engagement through self-determination**

The systematic approach implemented in this study, builds partly on health-promoting theory and partly on self-determination theory (Langeland & Horverak, 2021). Whereas health-promoting theory is concerned with how to create a sense of coherence (SOC) through meaningfulness, comprehensibility and manageability (Antonovsky, 2012), self-determination theory (SDT) is focused on how to achieve intrinsic motivation (Ryan & Deci, 2017). According to SDT, intrinsic motivation, which means a wish or desire to do something, is enhanced through meeting the three basic needs of competence, autonomy and relatedness. This means that a student experience mastery and control of one's own situation, as well as being part of a community. Ryan and Deci's (2020) meta-analysis on studies based on self-determination theory shows that there is a positive relation between autonomy-based motivation or autonomy-support in classes on the one side, and results in subjects, perceived competence and self-esteem on the other side. There is some overlap between the two theories which the five-step method applied in this study builds on, as both are concerned with feeling mastery and in control. By facilitating for autonomy, students become involved in finding solutions to the challenges that exist in the school environment, and through this, they participate to create a better and more inclusive learning environment.

## Methodology

This study investigates the potential of a five-step method for mastery, participation, and motivation in relation to engaging students in primary school to create a health-promoting and inclusive learning environment. To do so, an intervention has been carried out in four fifth-grade groups, resulting in 58 respondents (response rate 70 %). Reflections and evaluations have been collected from the intervention. In addition to this intervention in classes, the five-step method has also been implemented in the school through the student council with focus on improving the learning environment. The students themselves carried out the method in their own classes with support from the teacher. Material from the student council intervention is dealt with in a separate study, but the fact that there were two quite similar parallel interventions going on may have influenced the process in the four groups that are included in the current study. Qualitative and quantitative data are combined in the analysis, making this a mixed-method study (Teddle & Tashakkori, 2009).

The intervention included a five-step method for supporting mastery, participation and motivation, developed in the project SAMM (<https://samm.uia.no/en/frontpage/>). The five steps include identifying 1) what is important to feel good, 2) success factors, both in the individual and in the surroundings, 3) obstacles, 4) identifying a focus area, and 5) deciding on strategies to work with to make a change. In the first session, the students answered question one to three through a class discussion, and then they answered individually in books. The individual notes were all anonymous, and the students used codes on the books only they knew instead of names. The teacher collected the books, and in the second session of the intervention, a summary from the books was presented to the class. Based on the reflections, they discussed what they needed to focus on, and how they could do this. Then, they retrieved their books, by identifying their codes, and they wrote down focus areas and strategies they chose, making individual action plans. In the third and fourth sessions, the action plans were followed up, evaluated and specified. The students' reflections and action plans in the books are included as data material in the current study. In the results section, examples from the students' reflections on what is important and different obstacles are presented, as well as chosen focus areas and strategies.

To evaluate the method, the students filled in a questionnaire with claims and a likert scale of five, from "totally disagree" to "totally agree". The claims concerned whether the method helped them finding out what is important in school and in their spare time, whether the method made them want to work with what is important, whether they had managed to follow their own plans, whether they had become better at finding solutions to challenges, whether it helped them enjoy more being together in school and whether they liked the method. In addition, they were asked about their chosen focus areas. The results of the closed questions in the questionnaire are presented as bar charts.

All the material in the study has been collected anonymously, as the students have only written personal codes on all the material, and there is no key available concerning what code belongs to which student. The students' parents were given written information about the project and the data collection through a learning platform, and they were informed that participation in research was voluntary, and that they could contact the responsible researcher if they wanted to withdraw from the study. If this had happened, the teachers would have been informed so they could sort the material. The students also consented to participating in research by crossing out "yes" to this on the questionnaire. If answering "no", the book with a matching code was also removed from the data material.

## Results

To investigate how students may be engaged in creating a health-promoting and inclusive learning environment, results from the implementation of a systematic approach facilitating for mastery, participation and motivation are presented. This approach starts with identifying what is important for the students, by asking them to answer this question. The responses show that they generally thought it is important with friends, family, pets and activities, and these elements were also reported as success factors. In addition, some students wrote that it is important that everyone has friends and that no one is bullied, and this reflects obstacles the students reported. More of the students wrote about being bullied. One student wrote “that some boys bully me because they think I am weak because I am small”. Another student wrote “when someone says ugly things about me, I become sad”.

When discussing obstacles and making action plans, the most prominent theme was making sure everyone is okay, and that there is no bullying. The students suggested strategies as being a good friend, inviting others to play, saying nice things to each other and being good friends. In addition they wrote about interfering when bullying takes place, for example by saying “stop, don’t bully, this is my friend”. They also reported caring strategies, like comforting those who are sad and to be there for those who are being bullied. The second main focus area that the classes focused on is noise in class and making efforts to be more silent in class. This focus area was chosen in agreement with the teachers, and also influenced by the parallel process going on with the method being implemented through the student council, where this was mentioned as a big challenge. The students chose strategies as watching their own behaviour, being quiet, not throughing comments or shouting. One student wrote “not laugh when others are trying to be funny”.

The results from the evaluation show that the implementation of the five-step method has great potential to engage students in creating a better learning environment, and that the students were positive to using the method (figure 1).

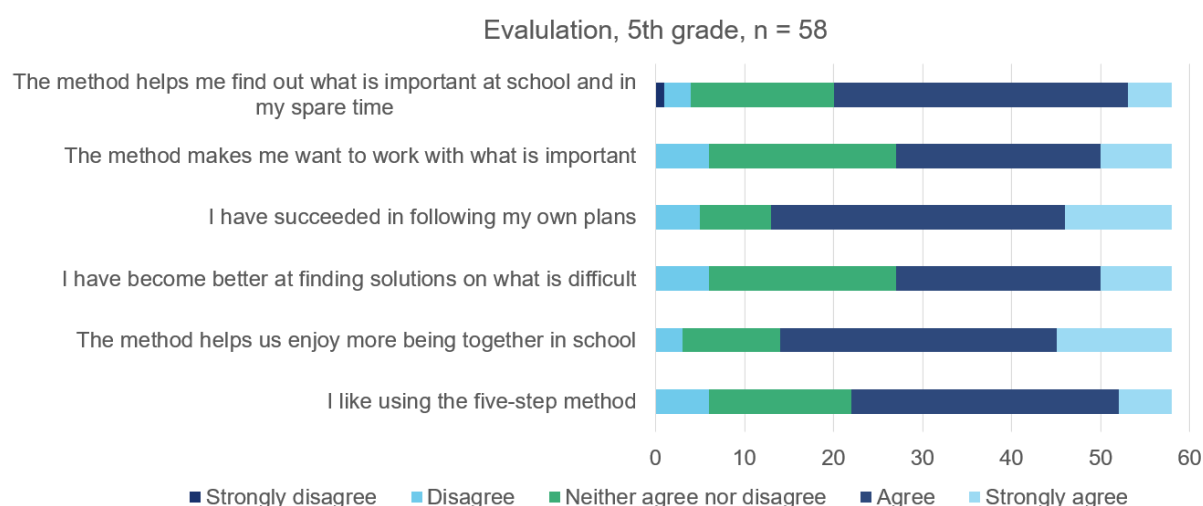


Figure 1: Results of the evaluation of the five-step method

Of 58 students, 38 agreed that the method helped them find out what was important and 31 agreed that the method motivated them to work with this. As much as 45 students reported that they had followed their own plans, and 31 agreed that they had become better at finding solutions to challenges. The focus in the action plans was on creating a better learning

environment for everyone, and 44 agreed that the method helped them enjoy being together. Finally, 36 students agreed that they liked using the five-step method. These results show that the majority of the students benefited from the implementation of the method.

## Discussion

The results of this study show that the five-step method implemented may facilitate for students becoming engaged in creating an inclusive and health-promoting learning environment. They suggested good strategies, many followed up as planned, and they experienced that this supported a positive atmosphere. The process described in this study supports meeting official requirements in the Norwegian educational context as described in the Education Act (1998, § 9a), that every student has the right to a safe and good learning environment. It also facilitates for getting students engaged in a meaningful way to form their own learning condition, which is also a requirement expressed through official guidelines in Norway (Meld. St. 6, 2019-2020). This process of engaging students as agents may lead to experiencing mastery, as is seen in the results of the evaluations, which again may lead to increased belief of mastery in future situation. This is what is called self-efficacy (Bandura, 1997, 2006). Increased self-efficacy supports students to take the role of agents in new situations, which again may promote success (see figure 2). This may result in a positive cycle of increasing agency and getting increased self-efficacy.

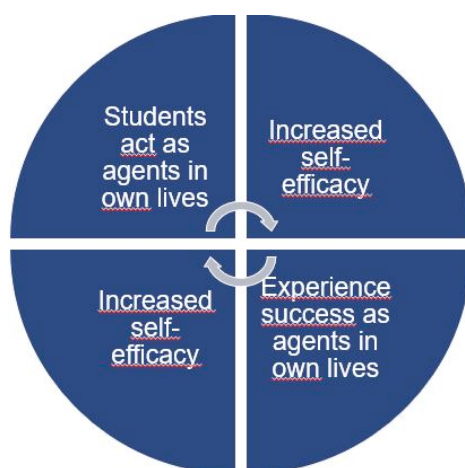


Figure 2: Based on Bandura, 1997, 2006; Skaalvik & Skaalvik, 2018

A challenge with these processes is that if students do not succeed with taking agency, they may experience failure which leads to a decrease in self-efficacy, and the cycle may become negative. Because of decreased failure, they do not dare taking the role of being an agent in future situations, and then miss out on the opportunities to succeed and experience increased self-efficacy. The Norwegian professor in psychology, Madsen (2020), criticises universal measures in general because of this type of risk. He claims that students who struggle to start with most likely will struggle to follow up on universal measures including elements of self-regulation, and that students who succeed in general, will benefit from them. In the current study, this aspect has not been investigated, and there is a risk that those who agree that the method is beneficial in different ways are the students who master school in general. To avoid increasing the gap between the students through applying universal measures, it is important that the teachers are aware of different individual needs and support the students who need this in the process. It may also be wrong to assume that children who struggle with



self-regulation cannot benefit from approaches emphasising this. A meta-analysis of studies on how to support students in middle school with behavioural problems shows that self-regulation is an important element of programmes that have a positive effect on both behaviour and learning for these students (Alperin et al., 2021).

Something that separates the current study from many other programmes that aim to create positive learning environments, is the strong role of the students in the five-step approach presented here, compared with anti-bullying programmes that emphasise the adult's role and actions (Ertesvåg, 2009; Olweus & Limber, 2012; Roland et al., 2010). In the anti-bullying programmes, it is up to the teacher to find solutions and follow up on these, whereas the five-step approach calls for the students to deal with challenges. Engaging the students in this way gives them autonomy in the situation, which again may lead to intrinsic motivation (Ryan & Deci, 2017). It also helps the students understand situations and find resources to deal with them, which may lead to an increased sense of coherence, and help them deal with stressful situations (Antonovsky, 2012). It also includes working with the structures of inclusion and exclusion in the environment, which relates to the newer understandings of bullying (Jørgensen, 2019) rather than singling out students as either bullies or victims of bullying, as the anti-bullying programmes do (Ertesvåg, 2009; Olweus & Limber, 2012; Roland et al., 2010).

There is a different view on humans represented in the different programmes. The anti-bullying programmes and the positive behaviour-programme presented above (Arnesen et al., 2003; Ertesvåg, 2009; Olweus & Limber, 2012; Roland et al., 2010) are based on a behavioural tradition (Vogt, 2016), where students are rewarded for good behaviour, and must deal with consequences of negative behaviour. This builds on a deterministic view on humans as being possible to manipulate and control through reinforcement (Johannessen et al., 2010). The five-step approach implemented in the current study, builds on a more humanistic view on humans, as having the potential to grow and take control of their own development and make the right choices (Johannessen et al., 2010). This includes giving students autonomy in the learning situation, which is important to develop intrinsic motivation (Ryan & Deci, 2017). It also supports them to understand the situation and find ways to handle it, which leads to a sense of coherence and an ability to cope with stress (Antonovsky, 2012). When the students themselves find solutions to challenges, there may be a greater chance that they feel ownership towards the strategies they have decided on, and they may be more loyal in following up.

The results in the current study are in line with previous studies from the project SAMM, showing that the five-step approach has the potential to support students in understanding what is important, find solutions to challenges, and make and follow up on action plans (Horverak & Aanensen, 2019; Horverak & Espegren, 2021; Horverak & Jenssen, 2020; Horverak, 2020). Even though the results here show a potential, they are based on self-reported data, and it may not be a fact that students for example have followed up on their plans, even though they report this. It is also a challenge that the current study is limited in scope, both when it comes to the number of informants and the time-period for the intervention. The intervention included only four sessions, which may be too little to expect any changes. Still, the results mirror results from other studies based on self-determination theory (Ryan & Deci, 2020), showing that autonomy is related to perceived competence and self-esteem in a positive way. Even though these type of concepts have not been measured here, the results signal that the approach has the potential to support students' motivation and engagement in school.

## **Conclusion**

Children in primary school may be engaged in influencing their learning environment and their own situation in a positive direction when teachers facilitate for this. The results in this study show that by applying the five-step method, the teacher may facilitate for creating a more health-promoting and inclusive learning environment by making the students agents in the process. There is a risk that some students benefit less from the approach, and perhaps these are students who struggle in general. Still, by taking part in the joint efforts that are facilitated, they may feel a success in class by experiencing that the class succeeds in making a change. However, not all challenges may be dealt with by the students themselves, and it is important that the adult, responsible person helps the students sort what they can change themselves, and what others should take responsibility for. Another important aspect to remember is that making changes requires continuity over time. The current study presents a short-term intervention, in a very limited context, and there is a need to investigate more long-term effects of applying the method in a large-scale study.

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### ***A Systematic Approach to Mastering Life – The Five-Step Motivation Method***

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The European Conference on Education 2022  
Official Conference Proceedings

#### **Abstract**

‘There’s a voice in my head saying you’re not good enough, you’re stupid, you won’t manage anything’. This is a quote from a student in the current study, reporting on challenges young people attending upper secondary school face. Over years in Norway, there has been a 25 % dropout rate, and students have reported low motivation and an increasing number of mental health issues. If this is not taken seriously, there is a risk that dropout numbers will become even higher, and that more young people risk failing to become integrated in working-life and social life at an early stage of adulthood. This study presents a method that facilitates for students in upper secondary school to reflect on their own lives and how they can take charge to determine their own development in school and life in general. By identifying values, success factors and obstacles, students become aware of resources within themselves, and also in the environment, so they develop resilience to handle possible obstacles in life. Based on written reflections from students in upper secondary school, a content analysis has been carried out, showing that many of the students struggled with worries or anxiety, stress and pressure, low confidence, and negative thoughts. Evaluations of the method show that 86 % (n=51) were satisfied, 63 % felt they had become better at planning and 56 % had become more motivated. The conclusion is that the method applied in this study may support students to handle struggles in life.

Keywords: Mental Health Issues, Motivation, Health Promotion, Upper Secondary School

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## Introduction

Mental health challenges have been on the increase in Norway for many years. Particularly young girls at the age of 15-17 have shown an increase in psychiatric symptoms (Reneflot et al., 2018). Some of the typical problems are depression, anxiety and challenges with adjusting to different contexts. Also drop-out numbers from upper secondary school have been constant around 25 % throughout many years (Alver, 2020), in spite of efforts made to change this trend. The consequences of dropping out of school may be serious. There is a clear relation between dropping out of school and being excluded from working life (Falch et al., 2009). In addition, young people who have dropped out of school, also have an increased risk of later drug problems and mental health problems (Furuberg & Myklebø, 2013). It is therefore important, as pointed out in different government reports, to work with inclusion and health promotion in schools (Meld. St. 19 (2018-2019); Meld. St. 6 (2019-2020)), which is the concern of the approach applied in the current study.

Surveys carried out in school quite recently show a negative trend after the pandemic, as more youth report that the pandemic has influenced their lives in a negative way, particularly when it comes to social meeting points and activities (Bakken, 2021). Even before the pandemic, there was a negative trend shown in surveys. As much as 29 % of the students in upper secondary school reported that they had been depressed or unhappy the last week, and 32 % reported feeling hopelessness concerning the future (Bakken, 2018). These reports are based on questionnaires students fill in with predefined categories. In the current study, students have been given the opportunity to define themselves what their concerns and obstacles in life are. By applying a five-step method for life mastery, they have been given time and space in school to identify own values, success factors and obstacles, and one of the issues investigated in this study is what health-related issues young people perceive to be stopping them from achieving what is important to them in life and in school. Furthermore, the study investigates whether the five-step method may support students to find own resources that can help them to deal with challenges in life.

The research questions in this study are: 1) What mental health problems do upper secondary students experience? and 2) Can a systematic approach to working with life mastery support students in handling obstacles and dealing with life? To investigate this, an intervention has been carried out in upper secondary school classes, and reflections from students have been analysed and summed up. This is a limited study, and it may be difficult to generalize from the results, but it may still give some insights into a serious challenge society faces with drop-out (Alver, 2020) and increased mental health problems (Reneflot et al., 2018), and possible ways to deal with this challenge in a school context. The five-step method applied in the intervention builds on self-determination theory (Ryan & Deci, 2000, 2017), health-promoting theory (Antonovsky, 2012) and theory on self-efficacy (Bandura, 1997, 2006), which will be elaborated on below.

## Theoretical foundation of the five-step method

One of the foundations of the five-step method developed in the project SAMM (2022), is self-determination theory (Ryan & Deci, 2000, 2017), stating that in order to be intrinsically motivated, one needs to experience competence, autonomy and relatedness (figure 1). Competence is closely related to experiencing mastery, and in a school context, a student needs to be able to deal with assignments, and the social context, to feel competent. If students succeed in mastering exercises in school, participating in social activities, or other



things in life, this may increase their self-efficacy, meaning their expectation to master in new situations in life (Bandura, 1997, 2006). If the opposite happens, that they do not master school or life, their self-efficacy decreases, and eventually, they may give up trying to make a change. Therefore, it is important that students experience mastery, and that teachers become aware of students' struggles and need of support. The five-step method implemented in this study is a framework for identifying students' obstacles and tuning in on their needs and motivations to facilitate for a positive development and experience of mastery.

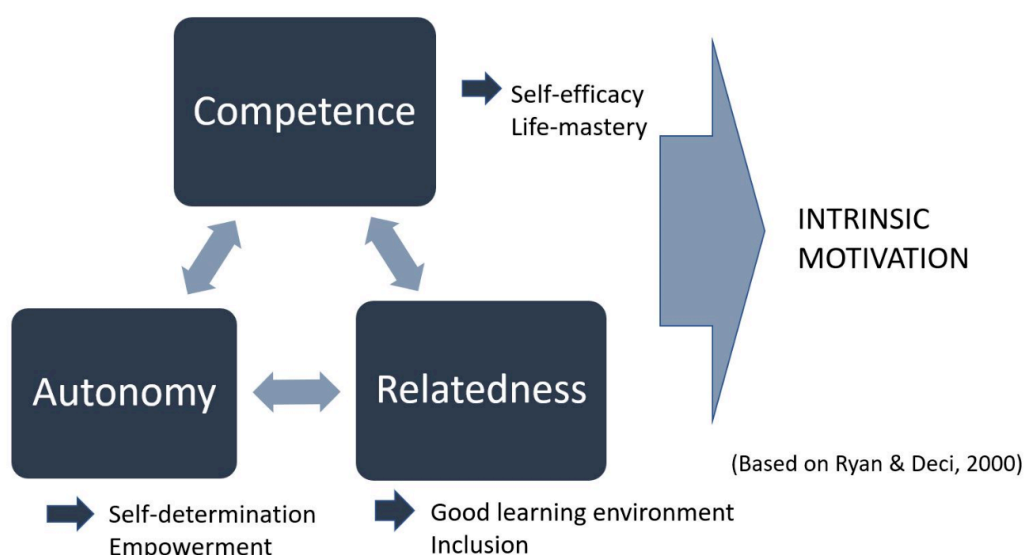


Figure 1: Self-determination theory (SAMM, 2022, based on Ryan & Deci, 2000)

The second basic need described in self-determination theory is autonomy (Ryan & Deci, 2000, 2017), which concerns controlling one's own life. Having autonomy means participating in making decisions that concern life, and in a school context, this concerns having an influence on the school day. Participating in making decisions supports a feeling of autonomy, which again may lead to increased motivation and better learning (Ryan & Deci, 2020; Skaalvik & Skaalvik, 2018). By letting the students choose what to focus on and how to deal with difficult issues through the five-step method, they are given a possibility to take control of their own development, and decide what they want and need to work on themselves, making them agents in their own lives. Claiming agency is about taking control and plan for one's own future, and increased agency may lead to increased self-efficacy, or expectation to experiencing mastery (Bandura, 2006).

The final basic need, relatedness, is about feeling that one is part of a community, having a sense of belongingness (Ryan & Deci, 2000, 2017). This is about building relations, to teachers and to peers. Applying the five-step method is about building relations in class and giving acknowledgement to students and their needs. It is crucial for students to experience acknowledgement of their skills, abilities, and generally for who they are (Jordet, 2020). Some students may not always master school very well, but most people have something they are interested in, or some skills or abilities. As teacher, it is important to "dig for gold" to find the students' positive sides and acknowledge them.

The five-step approach also builds on health-promoting theory (Antonovsky, 2012), which overlaps with self-determination theory to a certain extent. According to this theory, a person needs to experience a sense of coherence (SOC) to deal with stress in life, and a sense of coherence is achieved through experiencing comprehensibility, manageability and

meaningfulness (figure 2). According to this theory, having a sense of coherence contributes to develop resilience to deal with stress in life.

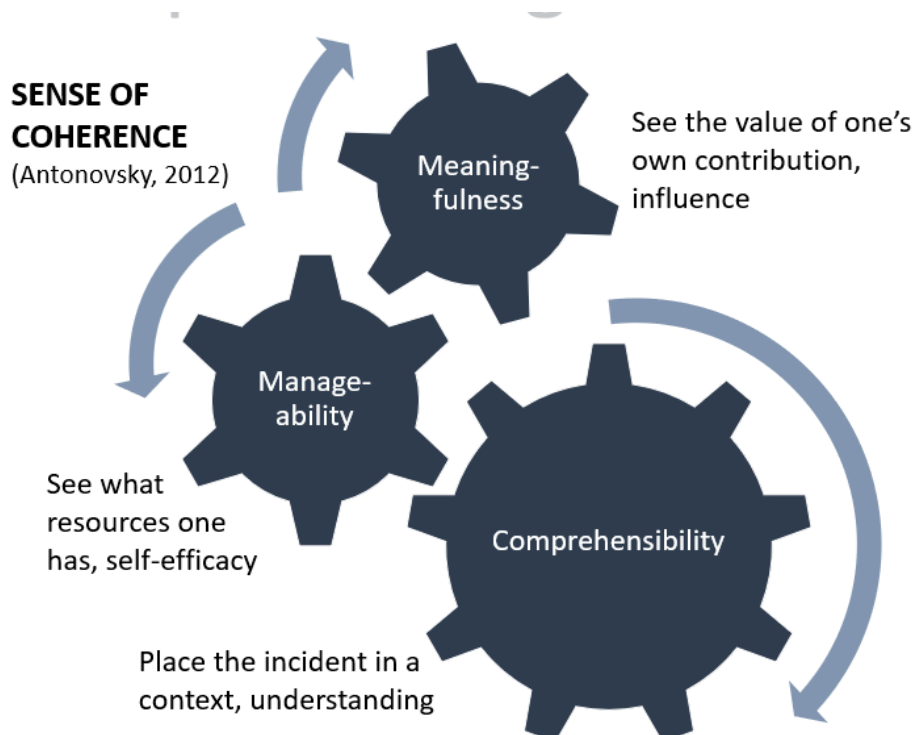


Figure 2: Antonovsky's salutogenic theory (SAMM, 2022, based on Antonovsky, 2012)

Comprehensibility is about understanding situations and placing incidents that occur in a context. Manageability is about seeing what resources one has available, and this overlaps with having a feeling of competence (Ryan & Deci, 2000, 2017) and self-efficacy, meaning an expectation to master situations (Bandura, 1997, 2006). In addition, Antonovsky (2012) adds the element of meaningfulness in his theory, claiming that to experience a sense of coherence, it is necessary to see the value of contributing. This is about feeling that one can make a change, and influence development. Without meaningfulness, there is no motivation, so meaningfulness is pointed out as the most important element in the theory. To activate students' experience of meaningfulness, the first question they are asked in the five-step method concerns what is important to them. In the following, the SAMM-approach will be described more in detail, as well as research methodology in general.

## Methodology

This study includes both qualitative and quantitative data, making it a mixed-method approach (Teddle & Tashakkori, 2009). The qualitative data includes students' reflections from an intervention with a five-step method for mastery, participation and motivation (Langeland & Horverak, 2021), carried out in several upper secondary school classes. The material has been analysed through a summative, traditional content analysis (Hsieh & Shannon, 2005). The quantitative data was collected through a questionnaire. The students filled in an evaluation form with different claims concerning the five-step method and crossed out on a 5-point Likert-scale from strongly disagree to strongly agree. They evaluated whether they were satisfied with the method and whether they had become more motivated and better at planning and finding solutions in difficult situations.

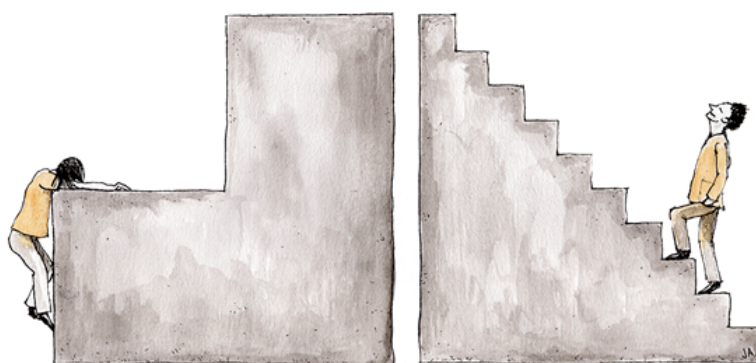
The intervention included four sessions spread over a term, with focus on how to master life, based on methodology developed in the project SAMM (2022). In the first session, two metaphors for mastering life were presented, and the first of these is a mountain (figure 3).



*Figure 3: Life is like climbing in the mountain (from Langeland & Horverak, 2021)*

Living is compared with climbing in the mountain. Sometimes, when standing at the foot of the mountain, the top may seem distant and impossible to reach. If one examines the mountain closer, and from different sides, one may find a way up. This compares with life. Sometimes everything seems impossible, and all hope may be lost. What is important is not to give up, but instead try to see life from different perspectives, and try to find a way to move forwards.

The second metaphor presented in class was two different stairs, and applying the five-step method is compared with climbing the stairs (figure 4). The students were asked how they felt about life and school, whether it was like the stairs to the left with a too large step, that everything felt hopeless and too difficult, or whether it was like the stairs to the right, that everything felt okay and doable. After class discussions, it was explained that the five-step method is about making the stairs appropriate, and taking one step at the time, by focusing on what is possible to change and improve in life with some efforts.



*Figure 4: The life stairs (from Langeland & Horverak, 2021)*

After introducing the two metaphors, the teachers started working with the first three steps in the five-step method (figure 5). The students discussed 1) what is important in life and school, 2) what skills they have and what they are satisfied with in life, and 3) what is difficult in life, that may stop them from achieving what is important for them. After a class discussion, the students wrote individual answers to the same questions in anonymous log

books that the teacher then collected, and these books were coded with numbers only the students themselves knew. The students' answers on question three, about obstacles, is the qualitative material analysed in this study.

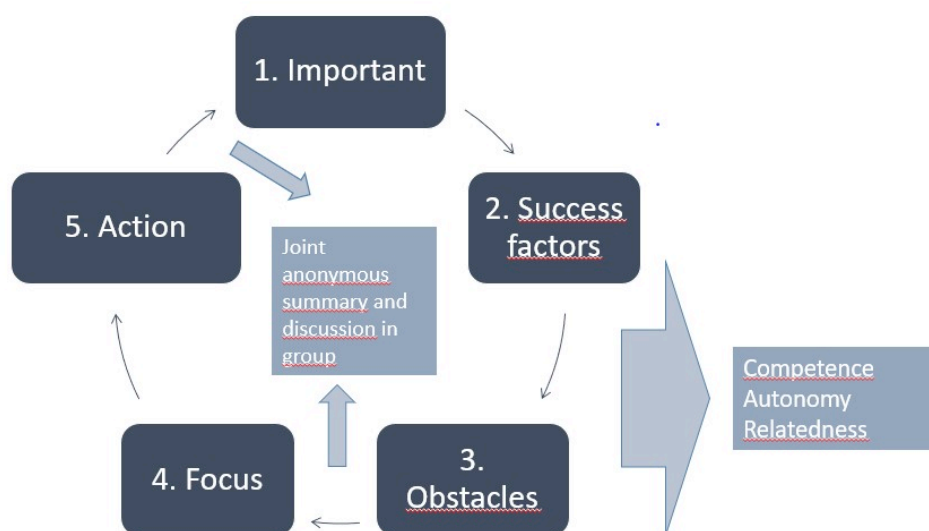


Figure 5. The five-step method (published in Horverak & Aanensen, 2019; Horverak, 2020).

In session two of the intervention, the teacher presented anonymous examples of answers from the students' logbooks to the class, and this was followed up with a discussion on how to deal with the mentioned obstacles to achieve what was important. The students came up with suggestions on what to focus on, and what specifically they could do to deal with different challenges. After the discussion, the students retrieved their logbooks, and wrote answers to the questions in step four and five of the method, making an action plan: 4) what will you focus on? and 5) what specifically will you do to manage this? The teachers then collected the books again.

In session three, the students were given examples of different action plans and discussed whether they could add more strategies or whether they needed to change to a new focus area. The students retrieved their logbooks, and evaluated whether they had followed their plans, and then adjusted or wrote new action plans, answering the last two questions in the five-step approach. This procedure was repeated in session four, and the students also evaluated the intervention in this session.

The sample includes 70 students in total from five different upper secondary school classes (response rate: 91 %). There is one general studies class and four vocational classes, of which two were Children and youth, one was Health and care and one was Restaurant and food processing. Logbooks from all students are included in the analysis. Due to absence, only 51 students filled in the evaluation form (response rate = 62 %).

## Results

Results of the summative, traditional content analysis answer the research question of what health-related problems upper secondary school students experience. A variety of mental health issues were identified through the analysis (table 1, n = 70). Both the number of

students who reported on different challenges is included in the analysis, and the number of occurrences in total.

Obstacles	Number of occurrences	Number of students
Anxiety, fear	7	6
Worries, uncertainty	22	10
Stress, pressure, too little time	39	15
Afraid of / concerned with what others think	10	6
Bad mood, angry	5	3
Low self-confidence, bad self-image	20	12
Heavy thoughts, overthinking, negative thoughts, crying, guilt	19	15
Specific mention of mental health issues or diagnosis	20	12
Low/lack of motivation	45	25
Self-critical, not happy about oneself	33	12
Negative influence from people (friends, family, teachers, peers)	23	11
Exhausted, out of energy	23	19
Sleeping problems	54	21
Mobile phone use	49	24
Digital media in general	22	8

*Table 1: Results of content analysis of students' obstacles*

The students reported on issues such as anxiety, fear, worries and uncertainty. They also experienced stress and pressure, and some were exhausted and out of energy. Some were concerned with what others may think, and some had a low self-confidence, or bad self-image. Students struggled with heavy thoughts, bad mood, and self-critical thoughts, as described in this quote: 'There's a voice in my head saying you're not good enough, you're stupid, you won't manage anything'. They also reported that they were negatively influenced by others, and that mobile phone use and digital media in general were problematic. Sleeping problems and other specific diagnosis were also described.

To answer the second research question of whether a systematic approach to working with life mastery can support students in handling obstacles and dealing with life, the students' answers to the evaluation form are presented (table 2, n = 51).

Evaluation claims	Agree
Satisfied with the method	86%
Become better at planning	63%
Become more motivated	56%
Become better at finding solutions	47%

*Table 2: Results of evaluations of the five-step method*

The evaluations show that 86 % of the students agreed that they were satisfied with the method, 63 % agreed that they had become better at planning, 56 % had become more motivated and 47 % had become better at finding solutions in difficult situations. One student wrote about learning problems, and reflected on own development: 'Dyslexia is both my weakness and strength. It depends on how I see it. When I look back, I can see all the challenges I have had, and see that I tried my best and managed to handle things'.

## Discussion

The analysis of students' obstacles related to health issues confirms the image drawn based on surveys and reports concerning mental health problems (Bakken, 2018, 2021; Reneflot et al., 2018). The students reported on problems with anxiety, stress, motivation, self-image and more. They also described mobile phones and digital media as problems, and there may be a connection between these different types of problems. The image of successful young people presented in media may add to the stress young people feel, and influence their self-image in a negative way. The increase of mental health issues may be related to the increased use of technological devices, and the creation of an 'ideal monster' that gives them a utopian and unrealistic view on what success is (Langeland & Horverak, 2021, figure 6).



*Figure 6: The 'ideal monster' (from Langeland & Horverak, 2021)*

Starting a joint process in class, deconstructing this monster, may help students feel less alone with their challenging feelings, and facilitate for finding motivation to deal with what is difficult in life. Investigating what is important in life, and finding one's own resources to work towards personal goals may lead to a sense of coherence, where one finds meaning, and believes in own abilities to handle stressful situations (Antonovsky, 2012). There may be serious mental health challenges that are revealed when working with this approach, and perhaps the students need professional help to find a way to cope with life. In these cases, the teacher may give information about available help, for example the school nurse, and sometimes the teacher must try to identify students with serious problems and help them seek help in the health care system. The students should not always be left on their own to solve problems they have.

The results of the evaluations show that many students experience the five-step approach as useful to plan, solve difficulties and find motivation. Applying the approach is a way of giving autonomy-support, and previous studies have confirmed the link between autonomy-support on the one side, and intrinsic motivation, perceived competence, self-esteem and decreased anxiety on the other side (Ryan & Deci, 2020). By identifying resources, both personal skills and abilities, and resources in the environment, such as a good friend or a teacher, the students may dare to take agency in their own lives. This means that they take control of their own development, which again may lead to increased mastery and self-efficacy (Bandura, 1997, 2006).

The current study is limited both in sample and duration of the intervention. It may be difficult to generalise based on the findings here, but still, the results show that there is a

potential in the five-step method that is worth further investigation. In addition, the approach described builds on well-established theory of self-determination (Ryan & Deci, 2000, 2017), health-promotion (Antonovsky, 2012) and self-efficacy (Bandura, 1997, 2006). Other studies related to the same project SAMM have also shown similar tendencies concerning the usefulness of the approach (Horverak & Aanensen, 2019; Horverak, 2020; Horverak, Langeland & Aanensen, 2020). Still, there is a need for a more longitudinal investigation to explore the potential of the SAMM-approach further. It would also be interesting to look more closely at which students benefit from the approach, who does not benefit, and why.

## **Conclusion**

This study confirms that young people struggle with many mental issues, such as anxiety, worries, heavy thoughts, sleeplessness and low self-image, and it describes a systematic approach to working with life mastery in classes that may support the students in dealing with life. Even though upper secondary school is much about preparing students for university studies, or about developing skills for future jobs, it is important to take young people's mental health seriously. One way of doing this is by bringing real life into class, as described in the approach presented here, giving time and space to stop and reflect on important issues in life.

## **Acknowledgements**

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***Progressing Education & Difference: Gifted Education, Special Education,  
Learning Difficulties & Disability Into a New Normal World***

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**Abstract**

The covid-19 pandemic has impacted higher educational institutions and student learning considerably, particularly as rapid transitions to remote learning platforms were implemented. Traditional education has focused predominantly on progressing the student majority within a class. However, during the pandemic many disparities have been highlighted including marginalising students with learning difficulties, disabilities, and gifted students. This study aims to understand educational differences between students in higher education during the covid-19 pandemic and how education systems have attempted to reduce inequalities. There is an endeavour to progress educational systems towards equality with a focus on gifted education, special education, learning difficulties and disabilities. A framework is devised to ensure students receive the appropriate learning pedagogies to progress towards their educational endeavours within the new normal. A systematic review has been implemented in this study using a well-planned literature search. Results have identified the following factors which are discussed within this study: E-learning, artificial intelligence (AI), importance of communication and appropriate support. This study has deduced that gifted students benefit the most from e-learning with embedded AI software, highlighting knowledge gaps and providing student flexibility to acquire education. In comparison students with learning difficulties, disabilities and in need of special education require a combination of e-learning and physical teaching assistance with frequent communication. Educators with specialised skills are required to impart knowledge through empathy and understanding of the student as a unique individual, to increase student confidence and progress education in the new normal world.

Keywords: COVID-19, Education, E-Learning, Gifted, Learning Disability

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## Introduction

Education is a fundamental component of personal and societal development (Somani, Our World Before, During and After the COVID-19 Pandemic, 2020). Students are given the right to education from the age of approximately five to sixteen years within the United Kingdom, after which they can choose to progress towards higher education (Gov.uk, 2022). The age range can fluctuate dependent on student country of residence (Mobbs, 2019). The medium of education was largely through traditional methods before the coronavirus (covid-19) pandemic. This consisted of instructions being imparted by educators to students through face-to-face interaction (Somani, The Role of Education During and After COVID-19, 2021). However, remote learning was not unheard of particularly for students requiring flexibility in their learning, due to work commitments or other responsibilities impinging upon their educational endeavours. Numerous universities provided remote learning courses to facilitate knowledge acquisition for students that were unable to dedicate time to full-time education. Hence, when the covid-19 pandemic resulted in global disruptions social, political, and economical, major disturbances were experienced within the field of education (Somani, TRADITIONAL LEARNING V'S BLENDED LEARNING. , 2021). The covid-19 pandemic has impacted higher educational institutions and student learning considerably, particularly as rapid transitions to remote learning platforms were implemented (Somani, A TRANSITION FROM FACE-TO-FACE TO REMOTE LEARNING DURIN COVID-19, 2020). Traditional education has focused predominantly on progressing the student majority within a class. There was segregation between organised age groups and learning abilities so that teaching pedagogies could be devised accordingly, to facilitate student development. Pre-pandemic, higher educational institutions accepted and enrolled students with learning difficulties and disabilities. Between 2018 and 2019 approximately fourteen percent of students that studied in England declared at least one disability, while 85.7% did not (OFS, 2020). Many higher educational institutions provided these students with the additional care that they required to facilitate their learning needs. In contrast, gifted students have been able to attend the higher educational institution of their choice and have been referred to 'assets'. It was largely because through them, the higher educational institutions would achieve better average passing scores, consequently creating a positive impact upon the educational institution. This contributed towards gaining popularity and attracting students to join their institution. However, despite high test marks, gifted students have unique needs that cannot be met via the conventional education system (Grantz, 2021). During the pandemic many disparities have been highlighted, relating to increased poverty and sustainability in addition to marginalising students with learning difficulties, disabilities, and gifted students.

## Background

The covid-19 pandemic has affected a total of approximately 98.6% of learners globally according to the United Nations in two hundred countries (UN, 2020) (Somani, 2021). The realisation of continuing educational development has been vital, hence online platforms were utilised. There was an aim to replicate traditional teaching pedagogies onto online mediums. For example, interactive videoconferencing software and increased social media presence. The rapid transition is believed to have created numerous challenges for students, particularly students belonging to lower socio-economic backgrounds (Kimble-Hill, et al., 2020). Moreover, students with disabilities have had their lives altered significantly in comparison the students without any disability during the covid-19 pandemic. Particularly due to the lockdown measures implemented by national and international governing bodies to limit the spread of the virus. Students have reported a rise in mental health challenges like

stress, anxiety and depression (Somani, The Impact of COVID-19 on Human Psychology, 2020). This is largely due to worrying about their future in education and attainment levels, in addition to financial worries and health implication including virus contraction. Previous research has indicated that lockdown measures implemented within pandemics is a significant factor contributing towards negative mental health implications (Leung, Ball, Sirl, & Britton, 2018). This can be observed amongst all students including those with learning difficulties, disabilities and students requiring special education. However, in addition to educational worries it is very likely that students with disabilities will be subjected to inadequate residential security and may face being homeless, have food insecurities and find attaining adequate help challenging, when compared to students with no disabilities or learning difficulties (Coleman-Jensen, 2020). These challenges have also been linked to unemployment, particularly as numerous individuals were experiencing redundancies and job losses during the pandemic (Somani, Progressing Organisational Behaviour towards a New Normal, 2021). It is important to understand the differences between students with learning difficulties, disabilities, and gifted students.

When a student has learning disabilities, they have a lower intellectual ability and struggle completing daily activities. This can include all elements of their life including completing mundane household tasks, managing their finances or even socialising (Mencap, 2022). There is a notable difference between students with disabilities and those with learning difficulties. The major difference is that the general intellect is not affected in a student with learning difficulties. Examples of learning difficulties include dyslexia, Dyspraxia, and attention deficit-hyperactivity disorder (ADHD). Students with learning disabilities are generally identified from a young age as they are unable to overcome challenges within a traditional education environment. Students requiring special education or special needs education are those who require modifications to the traditional methods of education. They differ from the average student either mentally, physically, or socially. Students requiring special education are usually those with cognitive, emotional, behavioural, or intellectual impairments. They may have disabilities due to impairments in vision, hearing, speech or learning disabilities etc (Brighton-Hove, 2022). In contrast, gifted learners are the opposite, they possess abilities that excel in one or more academic subject areas, or are perceived as talented within music, arts, sports, performing arts or design. Gifted or talented students have the ability to develop skills faster than their peers and excel in specific areas of academia (CCEA, 2022).

Numerous students experiencing learning difficulties and disabilities suffer with underlying health issues, thus it is vital that they stay safe aiming to avoid the virus. Contracting the virus could have an adverse health effect due to the immunocompromising nature of their health conditions (Fung & Babik, 2020). Therefore, with the transition to digital platforms the life of students with learning difficulties and disabilities affected their complete educational experience, including access to course content after educators had imparted their instruction and revealed their expectations.

Numerous individuals with learning difficulties and disabilities had opted to reside in higher education institution accommodations as in many countries that is a legal requirement to ensure a no discrimination policy. However, due to the pressures and constraints on educators to teach different modes of instruction to students, simultaneously supporting them during the pandemic, students with disabilities were largely affected giving rise to further inequalities.

## ***Objectives***

This study aims to understand educational differences between students in higher education during the covid-19 pandemic and how education systems have attempted to reduce inequalities. There is an endeavour to progress educational systems towards equality with a focus on gifted education, special education, learning difficulties and disabilities.

## **Methodology**

A systematic review has been implemented in this study using a well-planned literature search. This study has been guided by a measurement tool used to assess systematic reviews, the recommendations for methodological quality has been adapted and utilised. The literature search is initiated through searching electronic and manual databases to identify relevant literature sources. They included Google Scholar, PubMed, Gateway Lexis Nexis, Blackwell Synergy, and other published information sources and grey literature including magazines and Journals. The systematic search comprised of the initial search, identification, extraction, analysis, evaluation and interpretation of existing literature works. The highly sensitive search consisted of using the following keywords: Higher education, COVID-19, Students, Educators, Gifted students, Special education, Learning difficulties, Disabilities.

The inclusion criteria included published studies reporting educational differences between students in higher education during covid-19. Including accepted gifted students, those requiring special education due to learning difficulties and disabilities. This initial search resulted in identifying numerous literature sources, therefore it was important to identify useful sources providing evidence-based knowledge. To categorise the literature sources, titles and abstracts were read, then the full text was read prior to using the study. To aid this process towards the primary study selection the following exclusion criteria has been devised:

- Literature unrelated to higher educational institutions are not used
- Literature focusing entirely on higher education institutions during the COVID-19 pandemic are omitted
- Literature unrelated to gifted students, special education, disabilities and learning difficulties are disregarded
- Literature on languages other than English are excluded
- Older literature with similar information to recent literature are ignored
- Literature that does not provide enough technical information of their approach is overlooked

A total of forty texts have been assessed, however, a total of thirty-five literature sources are shortlisted to aid focus to this study. Upon analysing the papers, two are duplicated and therefore eliminated. After reading the abstracts and introductions another three literature sources are disregarded, leaving thirty literature sources for further investigation. After reading the full text of those literature sources one more is eliminated due to lack of implementation details. Therefore, twenty-nine literature sources have reached the overall criteria and included within this study as primary literature sources.

## Results and Discussion

Results have identified the following factors: E-learning, artificial intelligence (AI), importance of communication and appropriate support with a focus on gifted education, special education, learning difficulties and disabilities.

### *E-learning*

Remote learning using electronic platforms became the dominant method of educating students during the covid-19 pandemic (Somani, Post Covid-19 Effects on the Future of Students in Higher Education. , 2021). Educators were more inclined to favour active-learning courses through which teaching practices differed from traditional teaching pedagogies. Group discussions were carried out using breakout sessions within the interactive video conferencing software, if educators had enough knowledge to utilise it. Short and long answer questions were incorporated to test student knowledge and access to learning materials became challenging. Without sufficient support to ensure students were able to familiarise themselves with the software and hardware, despite their disabilities have been proven to struggle (Somani, Information Technology Challenges Faced during the Covid-19 Pandemic in Higher Education., 2021). Another challenge faced by all students is access to sufficient internet connectivity that would impinge upon communication clarity and educator instruction. Due to insufficient bandwidth or a lack of sufficient hardware and software, e-learning for students was extremely challenging.

Higher education institutions recognised the need for individuals to re-skill and up-skill to continue working and gain adequate skills to progress with the challenges of life. Therefore, numerous higher education institutions, created an array of different courses comprising of long-term and short-term courses. Some of which included Massive Open Online Courses (MOOC) to progress individuals, some courses had no financial implications attached, while other courses were available at a reduced cost (Somani, E-learning in Tomorrow's Age, 2021). Both presented qualifications upon course completion, facilitating student development. In the endeavour to progress students, many students themselves were expected to learn how to navigate through higher education software themselves. This posed problems for students with disabilities and learning difficulties. Research has revealed that students with disabilities experience exacerbated symptoms of their disability and an increase in stress levels, during examinations with new technology and videoconferences resulting in challenges and skewed results not reflective of their true academic ability (McMaughan, et al., 2021).

Higher educational institutions tried to reduce learning inequalities by offering more time and support to students that require it. However, this resulted in educators being overworked by dedicating long hours to provide the sufficient support to help students through remote locations (Brunsting, et al., 2022). Some higher educational institutions have run specific modules to familiarise students with the use of the new software and access the learning materials to facilitate their progress. Although this is a positive step, it has been dependent upon internet accessibility and that of sufficient hardware to ensure knowledge acquisition. Within traditional settings it was easier for students with disabilities to access course materials due to the support offered by the educator. If there was a misunderstanding within concept transmission, as the student did not hear the educator, then students were able to question their colleague sitting next to them or ask their educator by raising their hands. Alternatively, students were able to ask the educator their query after the class was completed. However, this was not possible through e-learning, although when educators

became familiar with the interactive elements of the video conferencing software they were using within their live streaming classes, an array of tools were then utilised. For example, if a student wanted to ask a question, they used the 'hand raise' function. This allowed the educator to be alerted to a specific student's need. Some preferred to utilise the 'chat' function through which shared questions could be asked and answered. As e-learning continued and blended learning was administered, students had the physical presence of an educator to ask for clarification of subjects. In contrast, gifted students who understand the E-learning process are likely to excel beyond their peers and continue independent learning due to the vast array of tools and information available within the software. Research has suggested that students with and without learning difficulties and disabilities in general have experienced numerous challenges adapting to the transition to virtual platforms for knowledge acquisition. However, it is more noticeable in students with disabilities due to heightened stress levels and mental health concerns (Wang, Zhao, & Zhang, 2020).

### ***Artificial intelligence (AI)***

When the rapid transition to online platforms took place, students did not find it as easy as anticipated to access course content. Particularly when knowledge gaps became evident due to poor examination results consisting of short or long answer questions or multiple-choice questions presented during courses. Therefore, when AI was implemented within software, students with and without disabilities were able to access course content. The software would identify knowledge gaps and divert them to appropriate learning materials to strengthen knowledge enabling students to pass future examination questions (Somani, Artificial Intelligence in Higher Education Post Covid-19, 2022). Learning materials were generated based on software activity through the use of AI which has facilitated student learning. In addition, due to the nature of remote learning, students have flexibility to choose their learning times, often dependent upon conducive learning environments. When students required assistance out of educator hours, students could consult 'chatbots' which are the AI version of educators that facilitated student learning. These chatbots and virtual tutors utilise AI with the aim of student-robot interaction so that learners can seek instant assistance to challenging question. The electronic human-robot facilitates student educational progression by providing an instant response to specifically engineers answers to questions with the aim of keeping learners motivated and cultivating interest (Somani, Post Covid-19 Effects on the Future of Students in Higher Education. , 2021). It is a solution through which students can seek answers to their burning academic questions at a convenient time for them. Admission within higher education institutions was supported through the utilisation of cryptocurrency as some used this method to provide a most cost-effective form of enrolment to their chosen institution.

The application of new technologies must be consistent in development but simultaneously, it must provide a humanised approach. Students with disabilities and learning difficulties often require assistance on an emotional level and learn solutions to their challenges enhancing their development, quality of life and social progression. The covid-19 pandemic has accelerated the development of AI, the use of the internet, data processing and the use of social media and as a result they have become dominant parts of daily life of students. However, as education progresses it is vital to link digital and technological knowledge with human traits that are social and emotional. The complete emphasis should not be on technology and goal orientation. A combination is vital to ensure the development of all students in higher education. During the pandemic, immense emphasis was placed upon knowledge in instruction, increased speed, and accuracy. All students and particularly those



with learning difficulties and disabilities require a more humanised approach to learning which amalgamates social and emotional abilities, thus improving health and safety.

### ***Communication and appropriate support***

Communication is key towards ensuring student understand the different modes of instruction and changes in learning pedagogies (Somani, EFFECT OF THE COVID-19 PANDEMIC ON COMMUNICATION, 2020). During the pandemic and the transition to remote learning from traditional environments, students with disabilities were unable to access many of the accommodations as they would perhaps have done during face-to-face situations. Conducive learning environments and proper accommodation are very important for ensuring student success in higher education (Gin, Guerrero, Brownell, & Cooper, 2021). The major challenges experienced by students with learning difficulties and disabilities included access to accommodation, a reduction in distraction testing environments, challenges with increased test time and availability of comprehensive notes from live streaming lectures. Students with difficulties also required closed-captioned video lectures, in addition to an adaptation in test proctoring (Logan, Gin, Guerrero, Brownell, & Cooper, 2021). Collaboration is required to find conflict resolutions and improved communication towards enhancing student engagement. A combination of technology and humanised approaches must be used to improve communication between students and educators, faculty members and higher educational institutions in general. Interpersonal relationships are more difficult for students with learning difficulties and disabilities to cultivate, hence communication with such students require additional tolerance and empathy. This was vastly difficult during the covid-19 pandemic as physical interaction was impossible, although an attempt was made to replicate it through video conferencing.

All students require adequate support and motivation to ensure progression and facilitation towards reaching their educational goals (Somani, UNDERSTANDING THE CONCEPT OF MOTIVATION AND LIFE SKILLS THROUGH LITERATURE, 2021). Although the world is gradually returning to a 'new normal', students with learning difficulties and disabilities require more support than students without disabilities particularly in finding the correct accommodation to reside in. In addition to support in: taking notes, sufficient interpreters for those who may have sensory impairments, transcriptionists and access to appropriate services through which examinations can be taken. Unfortunately, research has revealed that numerous undergraduate students are unaware of services available to them. This could be due to a lack of communication between the higher education institution and the students. Gifted students may not require as much communication and support as other students due to improved comprehension abilities to achieve the goals of an average student. However educators need to be mindful that gifted students are not neglected and require additional instructions through enhanced communication and support to progress towards reaching their full potential. It is possible that gifted students may reach a plateau in their learning as they wait for their peers to catch up, therefore educators must encourage gifted students to progress in their educational endeavours and provide sufficient motivation and support for this to occur.

### **Conclusion**

This study has deduced that gifted students benefit the most from e-learning combined with embedded AI software, highlighting knowledge gaps and providing student flexibility to acquire education. In comparison students with learning difficulties, disabilities in need of

special education, require a combination of e-learning and physical teaching assistance with frequent communication. It is evident that students with learning disabilities take longer to learn new skills and during the process they require the additional appropriate support. This enables them to disseminate complex information into simple comprehensible information which can be converted into knowledge. They also require extra time to interact with people that are new to them. Educators with specialised skills are required to impart knowledge through empathy and understanding of the student as a unique individual, to increase student confidence levels and progress education in the new normal world. Simultaneously, to facilitate talented students to flourish, there is a need to present them with challenges that will enhance their strengths and facilitate personal development. They will be able to activate their ability to bridge gaps between new and existing ideas through which their intellectual capabilities will strengthen. Gifted students thrive from new opportunities to work independently and engage in their specific areas of interest. Unfortunately, traditional classroom environments deprive gifted students of opportunities to excel.

### ***Framework***

A framework is devised to ensure students receive the appropriate learning pedagogies to progress towards their educational endeavours within the 'new normal' world. Educators should be equally responsible as students in highlighting when gifted students are ready to progress towards a more challenging syllabus and additional attention is required by students with learning difficulties and disabilities. The ability of gifted students exceeds the average student thus require more support in providing knowledge to students. However, due to a lack of time and constraints within educational institutions, providing students with heightened stimulating knowledge becomes challenging. Particularly due to time and constraints imposed upon educators.

To reduce discrimination in Higher educational institutions and provide an all-inclusive learning environment for their students the following steps within the framework have been recommended to higher education institutions:

1. Evaluate higher educational institution structure
  - This includes ensuring consistent statements within policies regarding students with disabilities, learning difficulties and special education. They must reflect the higher educational institution's mission and objectives.
  - Available Campus literature on equal access and it must be reviewed prior to distribution so that all students follow a unified process to apply for services.
  - An accessible administration office with a department designated to disability services and special education should be created. This will ensure effective reporting systems and the correct support is provided to students that require it.
2. Design and implement policies for students
  - Ensure all student information is kept completely confidential
  - For students including those with learning difficulties, disabilities and gifted students, it is important that the formation of written policies and procedures are implemented and include the whole educational process from admission, protecting personal documents, accommodation, teaching pedagogies, technological support ensuring correct use of e-learning, modes of communication and appropriate support.

- The whole student community within the higher educational institutions must be educated on expectations, handbooks and course schedules should be available in a variety of diverse formats ensuring student inclusivity.
  - Advance instruction to gifted students within exceeding areas, simultaneously provide additional support to students with learning difficulties and disabilities.
3. Create awareness
- Students and educators need sustainable mechanisms through which information about learning disabilities and difficulties can be passed to them. This will create an understanding between the fraternity ensuring all members of the higher education institution including, students, educators, professional services, administrative staff, and faculty members are all educated and possess the same knowledge to act in unison and eliminate discrimination.
  - All higher education staff and students should be equally aware about the services available so that support is readily available to all students.
  - All staff, faculty members and the administration teams must be familiar with the laws surrounding student accommodation so that students with learning difficulties and disabilities can be supported.
  - A separate team must be appointed to ensure well informed decisions can be made for diverse students that attend that higher educational institution. This will minimise disputes and enable correct processes to be followed.
4. Collaboration
- By working with multidisciplinary teams, the student experience will evolve, and discrimination will gradually be minimised particularly as they have heightened during the covid-19 pandemic.
  - University accommodation should be built through specialist consultation ensuring needs of all students are met.
  - A designated team of higher education staff and service providers must be involved in decision making processes.
  - Ensure knowledge remains up-to-date as policies and research is continuously advancing.
  - Financial assistance may be organised through collaboration between governmental and non-governmental organisations to support students that require additional assistance taking their socio-economic status into account.

Within an everchanging diverse world where covid-19 has caused major disruptions in student learning, it is vital that higher educational institutions build a community that responds to needs of their diverse student population. This includes students with learning difficulties, disabilities and gifted students. It is evident that everyone has specific educational strengths and weaknesses, this is true also of students with learning difficulties and disabilities. They also have academic preferences to teaching pedagogies. Therefore, students particularly those identified by educators require a tailormade approach to their learning needs. Higher educational institutions need to plan prior to student admission. They must have the capabilities of educating students that they are accepting into their institution. It is possible to help students with learning difficulties and disabilities in general to flourish within higher education, however this is only possible when different departments work together ensuring policy development and continuous refinement of legislations, teaching pedagogies reflecting modifications in the curriculum. In addition, higher educational

institutions are required to invest in sufficient technological tools including the appropriate hardware, software and good make provisions for stable and fast internet connectivity. Improved teaching pedagogies and administrative systems are also required to progress student knowledge and the educational institution. Investing appropriate time and resources into training educators towards ensuring effective student learning by re-skilling, up-skilling and changing attitudes towards the diverse students attending the higher education institution. It is important for all students that have gained academic admission not only to possess technical competencies but also ensure soft skill development. Therefore, although technology is an important facet of education, it should be used as a tool to provide value to education and improved efficiency. Societies must change their culture and practice towards implementing provisions to facilitate the elimination of discrimination within higher educational institutions. It must also be highlight that, working towards a shared goal of inclusivity is a shared responsibility.

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***Implementing the AoL Standard for the WI and BIT Curricula in AACSB –  
Lessons Learned at the FHNW***

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**Abstract**

Before 2014, the quality management process in all our programs has been rather informally and individually organized. In 2014, the management of the School of Business at the FHNW decided to set up a strategic project to achieve the AACSB accreditation to sustainably secure the role among the best business schools. Among other standards, AACSB deals with Assurance of Learning (AoL, standard 5 in the 2020 standards) with the clear goal formulated as "The school uses well-documented, systematic processes for determining and revising degree program learning goals; designing, delivering, and improving degree program curricula to achieve learning goals; and demonstrating that degree program learning goals have been met." The AoL process has been established step by step since 2015 and provided us with a guideline to check the mission-reference of our program goals and learning objectives and to continuously develop the program quality on a common database. This paper describes the implementation of AoL using the four steps "Determining Degree Program Learning Goals", "Measure", "Results" and "Closing the Loop" for the bachelor programs WI (in German "Wirtschaftsinformatik") and BIT (Business Information Technology). As examples, measurements and improvements for various modules (spanning from supply chain to the computer science domain) are discussed, underpinning the clear and significant progress in the management of curricula and in the monitoring of our study programs' effectiveness regarding student learning. Finally, we outline selected AoL initiatives at other universities and show how we can benefit from them to successfully enhance our project.

Keywords: AACSB, Assurance of Learning, Business Information Technology, Process Improvement

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## 1. AACSB as a driver of quality management

AACSB is considered as a highly internationally recognized and demanding accreditation for business schools worldwide (AACSB, 2022). The AACSB quality label proves that international quality standards are applied and met. The AACSB accreditation serves nationally and internationally to raise the profile and reputation of universities in the competitive education market.

AACSB requires systematic quality management through the requirements of nine standards which relate to the qualification of lecturers, the involvement of stakeholders, the target group-oriented quality of teaching and the impact on society. As a frame of reference for the development of the corresponding quality requirements, AACSB attaches great importance to the alignment of the university with its mission. In principle, however, AACSB assumes that successfully teaching at a business school is based on the use of academically and practically qualified teaching staff (faculty) who continuously work on maintaining their qualifications. AACSB pays special attention to continuous and systematic program development to optimize the professional and labour market-oriented learning progress of students.

The accreditation process of the School of Business at the University of Applied Sciences Northwestern Switzerland with the AACSB, initiated in 2014, aimed to sustainably support the cultural change initiated at the turn of the millennium in the sense of self-directed, yet externally controlled quality development (FHNW, 2022). According to the maxim "from a teaching to a learning (adaptable) institution", the quality processes were consistently oriented towards fulfilling the mission of the HSW and systematized at different levels.

To manage this process, a separate university development project was formed with a project leader from the university management and a total of eight specialists with simultaneous line responsibility for day-to-day business. This QM team was responsible for the implementation of the AACSB requirements at the university as well as for the constant exchange with AACSB on the status of ongoing developments until the successful accreditation in 2021. Although many requirements could be integrated into the daily business in the meantime, the project team continues to assume a steering function regarding the reaccreditation in 2026. The mission of our business school corresponds to the educational mandate enshrined in law and emphasizes those elements that are of particular importance for a business school and with which an important impact can be achieved with students and partners from practice and academia. The guiding principle of the mission is our mission statement:

*"We educate innovative and responsible specialists and (line) managers for an interconnected and dynamic world."*

Derived from this statement, the core business of our school includes evidence-based and scientifically sound teaching in the form of practice-oriented and vocationally qualifying degree programs and executive education programs. The acquisition and development of career-related competences is the focus of the AoL process. This ensures continuous and systematic program development. Goals and objectives are derived from the mission for each degree- and for each major executive education program. The learning objectives define measurable target competences that students and participants in continuing education should have at the end of their studies. The achievement of objectives is systematically and regularly monitored by analyzing performance records and conducting surveys among various

stakeholders. The insights gained from this lead to the continuous improvement of our education and training programs.

## 2 The AoL standard

This section describes the milestones in the process of AoL at the School of Business FHNW as well as the tools and committees that support the implementation.

### 2.1 Strategic initiative for enhancing degree programs at School of Business FHNW

With the implementation of the AoL process as part of the AACSB accreditation, the formal process of defining competency-based goals for degree programs including executive education was initialized. Previously, the programs were rather oriented towards the content taught. The formulation of the goals was developed in several iterative workshops with the program heads. The goals (2) were aligned and sharpened on the one hand with the mission statement of the School of Business (1) and on the other hand with the positions to be attained by the graduates, i.e. in line with the desired professional profile. For each goal, one or two objectives (3) were defined, which specify the competencies to be acquired by our graduates. In order to ensure their implementation in the degree program, the learning goals (4) of the modules are aligned with the objectives of the degree program. Rubrics (5) are designed in collaboration with the faculty for the measurements in the modules, which are used to assess student performance. At the module level, the objectives are broken down into characteristics, resulting in a detailed description of the objective. The application of these rubrics is described with examples in chapter Assessment via rubrics and traits. *Error! Reference Source not found.* illustrates these dependencies.

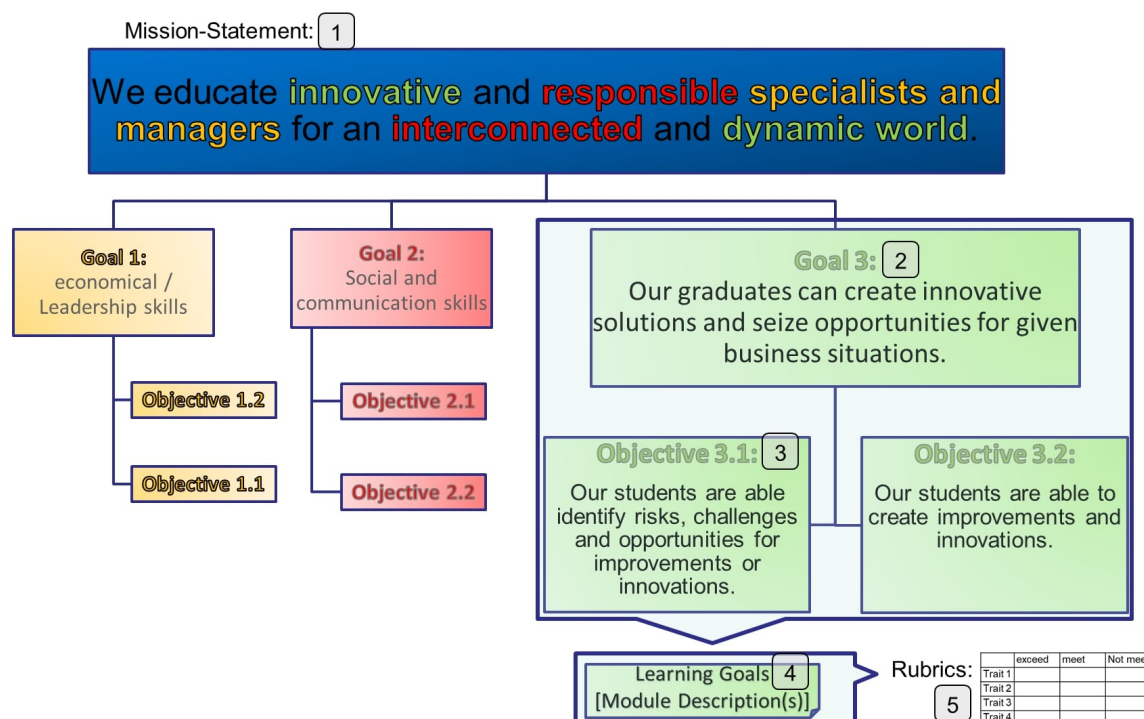


Figure 1: Linking the core elements of our mission with the learning objectives of our modules

The above-mentioned workshops with the participating program heads of the degree programs and executive education were transferred to a new body: the Curriculum

Committee. This platform serves all parties involved in the assurance of learning process to exchange experiences, clarify questions and share best practices. The training offered ranges from Business Administration to Business Artificial Intelligence or, in executive education, delves into topics from Human Resource Management to Consulting. In this respect, the Curriculum Committee also serves the goal of differentiating the diversity of the program offerings. To this end, workshops are held so that the necessary discussions can take place among the program heads.

The goals in the AoL process represent an "extract" of the program. In order to obtain a more comprehensive target picture of the competences of our graduates, the competences from the objectives were identified and supplemented with other relevant competences, so that a complete graduate competence profile was created. Through this procedure, we have obtained competence profiles of our graduates for all degree programs and the executive education. Here, too, the curriculum committee was chosen to conduct the relevant discussions.

## 2.2 AoL process and core elements

The key element of the AoL process is the Curriculum Map (see *Error! Reference Source not found.*). This document is a matrix that shows the goals and their corresponding objectives in the horizontal axis and lists the modules of the curriculum in the vertical axis. In the corresponding columns of the matrix, the modules are assigned to the objectives as described in chapter 3.1 AoL IT-infrastructure. The objectives described in the previous section are assigned to the individual modules in the curriculum map.

The planning of the measurements is done in the document "Timeline". This is to ensure that the workload is distributed over the five-year cycle. Documentation of results is done in "Curriculum Development". Important events are marked and summarized. Measurements are preferably made on the basis of rubrics, which are also used for the measurements in the performance records. The expected performance results are described in corresponding traits.

## 2.3 AoL improvement cycle

Competence orientation is making its way into the educational landscape. How can the AoL process contribute to this? As mentioned, a cycle lasts five years. Within this time span, one point of measurement (module) and two assessment dates are defined for each objective. The results of the first measurement are analyzed and, depending on the assessment, measures are defined to improve the result by the next measurement point. The performance of the program is measured and not the performance of the students. Therefore, the measurement in a module of the third semester will be measured again in the third semester for one of the next cohorts. In order to have measurements developed appropriately, they should be applied and verified in at least one implementation of the module before a second measurement is taken and documented for the AoL process.

Furthermore, the point of measurement is shaped by attributes such as location and study model. This means that not only the semester of the module is decisive for the point of measurement. If a module is taught at several locations, the measurement is carried out in parallel at all locations. This should reveal any weaknesses or disadvantages due to different infrastructures or teaching methods. In addition, students of the full-time and part-time study

models are measured in order to focus on possible weaknesses in the curricular sequence or the sequence of modules.

However, the AoL process not only considers performance components, but also qualitative feedback from students as well as from other stakeholders like lecturers and practice partners.

### 3. Implementation of AoL in the WI / BIT programs

In this section the implementation of AoL in the WI and BIT bachelor programs are discussed. Firstly, we outline the AoL IT-infrastructure, and then for selected modules example assessments are presented for the period 2020 - 2025. We conclude this section with a summary of experiences gathered.

#### 3.1 AoL IT-infrastructure

The IT-infrastructure for AoL consists of an MS Excel spreadsheet and a linkage to MS Power BI for generating dashboards visualizing specific scenarios. The AoL Excel spreadsheet (for short AoL Excel) mainly contains the following register:

- Curriculum Map: The curriculum map shows basic module information (module name, assignment to a module group, percentage of students attending the module). Furthermore, the relationship of every module to the fulfilment of an objective is given via the level of immersion. The following values are possible (listed with increasing level of immersion)
  - No relationship (-)
  - Covered incidentally (C)
  - Introduced (I)
  - Emphasized (E)
  - Reinforced (R)
- Timeline: Overview showing which modules are used to measure the fulfilment of the respective objectives. Additionally, a box gives insight into the results for M1 and M2 together with an expressive color (green and red) and links to the measurement files.
- ProDevGoal: This is a log file for monitoring M1 and M2 together with the dates, type of improvement, actions taken, and Closing the Loop (CtL) information. If findings are significant, they are copied to a summary register.
- Summary AoL: A summary of all important findings, improvements and CtL information which may be used as basis for a discussion across programs. When building an AoL knowledge management system, this is one of the most important sources.
- Competences: For every module this register informs about three relevant competencies which really matter. As basis for selection, a generic list of competencies was developed. In the mid-term of the AoL improvement program, competencies will be mapped onto the objectives.

Figure 2 shows a snapshot of the current curriculum map for the BIT program.

Curriculum Map		Mission-Statement HSW: We educate innovative and responsible managers for a networked and dynamic world.									
1_05 BSc Business Information Technology Basel and Brugg-Windisch		Skill Area:		Skill Area		Analytical thinking		Communication: written and oral		Reflective Thinking	
GOALS		Goal 1 Our graduates acquire in-depth knowledge and skills in process management.		Goal 2 Our graduates develop and evaluate feasible solutions to business Information Technology problems.		Goal 3 Our graduates communicate convincingly and in a manner appropriate to their audience.		Goal 4 Our graduates are responsible specialists and managers in a dynamic IT environment.			
Competences:		Competences en		Competences en		Competences en		Competences en		Competences en	
Objectives		Objective 1.1 They can model and optimize processes.		Objective 1.2 They can support and map processes with IT systems in a suitable manner.		Objective 2.1 They can analyse the functionalities and possible uses of existing applications and assess their potential benefits for various fields of application.		Objective 2.2 They analyse business management problems and develop practical solutions in a systematic way.		Objective 3.1 They can present their own work results for a specific target group in written form in a comprehensible and convincing way.	
		Objective 3.2 They can present their own work results for a specific target group in written form in a comprehensible and convincing oral form.		Objective 4.1 They can independently analyse information about current IT trends and critically assess their significance for application in organizations.		Objective 4.2 They can analyse company-related information and prepare strategic decisions based on it.					
		Hickelgruppe AACSB		AACSB Standards							
Foundation		1 Business Communication 1		9 100%				I		I	
		2 Business Communication 2		9 100%				I			
		3 Business Communication 3		9 100%				E		E	
		4 Business Maths 1		9 100%							
		5 Business Maths 2		9 100%		C		C			
		6 Statistics and Probability		9 100%				I		E	
		7 Ethics and Law		9 100%						C	
Business Administration		8 Principles of Management		1 100%		I		I		I	
		9 Accounting		9 100%		E		C		C	
		10 Marketing and Social Media		9 100%		E		C		I	
		11 Economics		9 100%							
		12 Logistics and Supply Chain Management		7 100%		E		C		E	
		13 Corporate Finance and Controlling		7 100%		G		E		C	
		14 Corporate Strategy		1 100%		C		C		C	
Information Technology		15 Programming		9 100%		E		I			
		16 Requirements Engineering		7 100%		I		I		E	
		17 Software Engineering		7 100%		E		I		C	
		18 Database Technology		9 100%		C		E		C	
		19 Internet Technology		9 100%		E		I			
		20 Enterprise Content Management		7 100%		C		R		E	
		21 Digital Enterprise		7 100%		C		R		C	
Business Information Technology		22 Introduction to Business Information Technology		7 100%		I		I		C	
		23 Business Process Management		7 100%		E		E		C	
		24 E-Business		7 100%		E		E		C	
		25 Enterprise Systems		7 100%		C		C		C	
		26 Business Intelligence		7 100%		R		E		C	
		27 IT Security		7 100%		E		C		C	
		28 IT Management		7 100%		C		C		R	
Student Work		29 Project Management		7 100%		C		E		E	
		30 Topics in Business Information Technology		9 100%		R		R		R	
		31 IT Project		9 100%		R		R		R	
		32 Practical Project		9 100%		R		R		R	
		33 Bachelor Thesis		9 100%		R		R		R	

Figure 2: BSc BIT curriculum map

### 3.2 Selecting modules for assessment

In the following we investigate the assessment of the following three AoL goals / objectives as they are defined for WI / BIT:

- Goal 1: Our graduates acquire in-depth knowledge and skills in process management.  
Objective 1.1: They can model and optimize processes.
- Goal 2: Our graduates develop and evaluate feasible solutions to business Information Technology problems.  
Objective 2.2: They analyze business management problems and develop practical solutions in a systematic way.
- Goal 4: Our graduates are responsible specialists and managers in a dynamic IT environment.  
Objective 4.1: They can independently analyze information about current IT trends and critically assess their significance for application in organizations.

As examples, measurements and improvements for selected modules are discussed, underpinning the clear and significant progress in the management of the curriculum and in the monitoring of our study programs' effectiveness regarding student learning. A module can only be selected for measuring an objective when its level of immersion is strong enough, i.e. emphasized (E) or reinforced (R).

The modules which serve as examples for the assessment of objectives in this paper are:

- Module Logistics and Supply Chain Management (LSCM, Objective 1.1)
- Module Corporate Finance and Controlling (CFC, Objective 2.2)
- Module Topics in Business Information Technology (ToBIT, Objective 4.1)

### 3.3 Assessment via Rubrics and Traits

Assessment in the modules LCSM and CFC is done via an exam, in the module ToBIT students write a report. For each module the responsible lecturer describes traits together with criteria defining levels when exceeding, meeting and not meeting expectations. For CFC an example trait is defined as follows (Table 1):

Trait No	2.2a
Trait Name	Investment and financing decision-making
Level Exceeds Expectations (EE)	Can distinguish between investment and financing decisions and correctly classify all examples.
Level Meets Expectations (ME)	Can distinguish between investment and financing decisions and correctly classify some examples.
Level Does not meet Expectations (DnM)	Cannot distinguish between investment and financing decisions or cannot classify examples.

*Table 1: Example trait for module CFC*

AoL measurements are normally integrated as questions or sub questions into the regular exam in order not to overburden the lecturer with redundant correction work. The measurement results for all traits are entered into the AoL Excel and analyzed if improvement actions are necessary. For that purpose, the lecturer may use some predefined rules or overrules (with regards to the thresholds) them if needed. Some example rules are shown in the following Table 2.

Assessment too good when $EE \geq 30\%$
Assessment ok, when $30\% \leq ME \leq 60\%$
Assessment not accurate when $ME + EE \geq 90\%$
Assessment too bad when $DnM \geq 20\%$
Assessment too bad when $EE \leq 10$

*Table 2: Predefined business rules for AoL assessments*

The person in charge for AoL in a degree program and the responsible lecturer are then discussing if improvements should apply and if this is the case what actions must be taken in detail.

If an improvement applies, because one or more business rules are violated, the key decision is to go for a content or – or system improvement. A content improvement (CI) comprises all actions related to "modifying" content. In particular, the following actions are possible:

- Content: adding, deleting, replacing, deepening content, changing the order of content
- Entry knowledge: updating requirements
- Adapting methods: integrating e-Learning, changing from individual to group work or vice versa
- Module assessment: oral instead of written exam, changing from individual to group work or vice versa

System improvement (SI) deals with changing the measurement system consisting of objectives / goals, rubrics and measurement points:



- Rubrics: redefining metrics, redefining rubrics
- Lecturer: training lecturers in AoL
- Measurement point: moving the module to a different term, replacing the module
- Objectives / goals: redefining goals / objectives

Documentation of a measurement includes the date, participating actors, defined actions, deadline for implementation and actors in charge. The key information regarding the assessment together with a link to the assessment sheet is entered into the AoL Excel.

### 3.4 Experiences gathered

#### 3.4.1 Module LCSM (WI)

For M1 (part-time class) it turned out that students faced difficulties with regards to understanding SCM methods. The lecturer decided to put more material about modelling and quantitative optimization on the e-Learning platform Moodle (CI) to foster the understanding.

For M1 (full-time class) the results were like M1 in the part-time class. Therefore, the guided self-study on Moodle was expanded accordingly (CI) considering that Moodle is the most important source of information for students. Figure 3 contains a screenshot of the results of the discussion between the LCSM lecturers and the AoL representative.

<b>Program:</b>		BSc in Wirtschaftsinformatik		<b>Location:</b>		Olten								
<b>Point of Measurement:</b>		Logistics & Supply Chain Management		<b>Date:</b>		25th January								
<b>Measurement No.:</b>		1		<b>Year of Study:</b>		4th Year								
<b>Number of tested students</b>		34		<b>Model:</b>		Part-time								
<b>Lecturer:</b>		Ehrental, Joachim												
<b>Goal: 1.</b>		Our graduates acquire in-depth knowledge and skills in process management.												
<b>Objective: 1.1.</b>		They can model and optimize processes.												
I. Traits		Exceed			Meet			Not meet			Students control	Action necessary?	Improvement Type	Remarks concerning Actions
		Actuals	%	Target	Actuals	%	Target	Actuals	%	Target				
	Process Perf	check	16	47%	> 30%	13	38%	ok	5	15%	ok	34	no	
	Process Mod	check	3	9%	< 10%	19	56%	ok	12	35%	> 30%	34	no	
	Quantitative	check	3	9%	< 10%	10	29%	< 30%	21	62%	> 30%	34	yes	Content Improvement
	Qualitative	check	16	47%	> 30%	14	41%	ok	4	12%	ok	34	no	
	Trait e		0			0			0			0		
	Trait f		0			0			0			0		
	Average			28%			41%			31%				
I. Evaluation scale: Result of measurement ... (Suggested Actions:)														
... rated too good if 30% "Exceed" (System Improvement)														
... okay, if "Meet" between 30% and 60% (System Improvement)														
... not accurate, if 90% or more "Meet"/"Exceed" (System Improvement)														
... too poor, if 30% or more "Does not Meet" (DnM) (Content Improvement)														
... too poor, if 10% or less "Exceed" (Content Improvement)														
Notes / Conclusion		Date	21.03.22	Who	Ehrental, Telesko			Defined Actions		implement by:		Person responsible:		
Traits 1.1a,c are snapshots (i.e. more questions in the exam where measured but not reported here). When taking into account these similar questions, the results of the AoL measurement even out, so no need for action. Quantification, however, is becoming increasingly difficult for students. Therefore, the guided self-study will be expanded accordingly. This is in line with students readily using the rich Moodle content and acknowledging its usefulness as per the evaluation. Note that the overall exam was harder than for the last measurement (cf. anchor questions).								Improve self-study for quantitative questions (e.g. Moodle calculated)		Fall 2021	Ehrental, Joachim			

Figure 3: Example assessment for module LCSM in the WI program

For M2 (again part-time class) the understanding of quantitative methods was improved. For a better separation of the students into the three categories EE, ME, DnM it was agreed to refine the exam grading in future exams (SI).

#### 3.4.2 Module CFC (WI)

For M1 (full-time class), it turned out that the material in the module was adequate with regards to quality and quantity provided. Additionally, in the conducted lecturer assessment there were no complaints regarding the topics addressed in the traits. It was decided that the one trait with bad results will be focused again in M2. For M2 (part-time class), the results



were similar or even better than for the full-time class. Therefore, no CI or SI were necessary. The only action taken - based on discussions with the program heads - was to conduct intermediate tests for "stimulating" the performance of the students. With regards to one particular trait, it was agreed to raise the "level of ambition" in future exams.

### **3.4.3 Module ToBIT (WI and BIT)**

ToBIT is a seminar where students write a report about a well-defined research topic and thus learn how to deal appropriately with research questions, concepts, and models. This module serves as a preparation for the more complex Bachelor Thesis at the end of the study.

In M1 (part-time class) it turned out that there exist some severe deficiencies, especially regarding models, research questions and a critical appraisal of future work. M1 for the full-time class was similar, slightly better. It seemed that the technical terms are not understood, and concrete examples were also missing. From the next ToBIT on it was agreed to provide the students with a clear definition of the technical terms and some easy-to-understand examples for theoretical and more practical ToBIT topics (CI).

In M2 (full-time and part-time classes) the only trait which remained insufficient was "critical appraisal of future work". The main reason for this is that students have a limited overview about the research area and its future development and fear to create incorrect judgements. For improvement, it was agreed that the lecturers discuss this topic in an in-depth manner during kick-off. Either this topic is irrelevant (for practically oriented topics) or the lecturer gives concrete hints (references etc.).

## **4. AoL implementations at other universities**

This section describes various approaches related to AoL at other universities. The insights gained will help to enhance the maturity of our implementation and better understand the complexity of AoL and diversity of its success factors.

Baker et al. (2012) describe experiences with the AoL process at the College of Business and Public Administration (CBPA) at California State University, San Bernardino. They focus on a module entitled "Ethical Reasoning", a module which also exists in a similar form at the WI / BIT program (entitled Ethics and Law). The Public Administration Department (PAD) is responsible of managing and further developing this module. The AoL Assessment Cycle is quite similar to what we defined at the FHNW (PDCA cycle – plan, do, check, act). It consists of five assessment phases (Baker et al., 2012, p. 22):

1. Delineation of learning goals: Discussing and formulating learning goals with faculty from the business majors.
2. Curriculum alignment: Developing and aligning student course material and expected learning outcomes and reviewing with PAD and business majors' faculty.
3. Assessment measurement: Constructing pre and post module assessment instruments and reviewing them with faculty. No specific insight is given about the AoL IT-infrastructure (user interface, databases etc.).
4. Data collection and analysis: Administering the assessment instruments and reviewing results with the CBPA's AoL committee.
5. Assessment documentation and use for continuous improvement: Reviewing results and determining necessary improvements.

Of particular interest are the lessons learned in the contribution (Baker et al., 2012, p. 24f). With regards to faculty involvement and coordination the authors stress that the whole AoL design and implementation should be an open process considering relevant stakeholders (especially faculty and students) and enabling enough flexibility for individual instructors to achieve the same learning goal. According to the authors it is a clear advantage to have AoL learning goals defined prior to structuring and implementing a module. This goes in line with the experiences at the FHNW where it turned out that reaching an evolving learning goal requires in most cases multiple updates to the module content and increases dissatisfaction of participating faculty members. Furthermore, the authors believe that a single, isolated module is very likely not changing the behavior of students. Therefore, they propose to ensure that "critical" - according to our understanding of AACSB all - AoL goals are integrated across multiple modules. We fully agree with that and made sure that in our curriculum map the level of immersion of a module for assessing a goal is at least "E" and that various modules across the module groups can be used for assessments. Finally, the authors are convinced that both feedback from an overall curricula perspective and individual course assessments are necessary to guarantee sustainable continuous improvement. We share this view of holistic data acquisition and offer for that purpose various events and stakeholder groups for the assessments. An event can be a measurement, a student assessment, a program evaluation, a meeting, and the like. As stakeholders we defined alumni, teachers, students, the curriculum committee, employers, advisory and sounding board. With these instruments we are optimally prepared to get a multi-dimensional insight into the WI / BIT programs, from assessing a single module to a global survey of employers concerning the future digital skills.

The paper of Kohli (2018) is of particular interest because it is comparing students' performance with and without the AoL model for a capstone course in the finance program. The class size was approximately 20 students. Two scenarios were compared, one with and one without AoL. Without AoL, the students undergo a group work, resulting in an overall performance of approximately 85% passing the module. With AoL, an exam is used for assessing students. The percentage of students passing the exam decreases to only 59%, resulting in a total performance of 82%, when counting exam and group work together. Thus, this research stresses the importance of AoL measurements by focusing on poor learning outcomes of students in the exam compared to the group work.

Taib & Ahmad (2017) discuss the application of the Six Sigma method in an AoL environment. University Utara Malaysia (UUM) awarded the AACSB accreditation in 2016. This paper explores the usage of Six Sigma in measuring course learning outcomes. Additionally, it aims at predicting process variation, productivity and process capability of three assessment methods (quiz, assignment and the final examination) for a first-year undergraduate Quality Management System course at School of Technology Management and Logistics with a total of 50 students involved.

Adeinat et al. (2022) describe an approach for using Six Sigma combined with Lean Management (LSS) to manage AoL in the domain of higher education. Their experiences were that Six Sigma can bring a clear added value with regards to AoL effectiveness and efficiency and highlighted three success factors for LSS: clear responsibility of the stakeholders, a common language for LSS within the cross-disciplinary team to foster collaboration and definition of quantifiable priorities.

We now investigate in detail how Six Sigma and LSS can bring forward the AoL initiative at the FHNW. First, Six Sigma can be regarded as a quality improvement methodology that

applies statistics to reduce variation in processes and products. The term "Sigma" is regarded as the amount of process variation contained within the customer specification limits LSL and USL. Six Sigma was originally invented for optimizing processes in the product and service sector with a fact-based approach and is widely regarded as one of the most effective process improvement methodologies. It is now widely accepted and implemented also for learning processes.

The main idea is clearly to increase the "Sigma" which is the key metrics for measuring quality. How can Six Sigma be used to measure learning outcomes within AoL? Figure 4 shows a Six Sigma process for normally distributed data. Six Sigma on each side of the Gaussian distribution correspond to 3.4 defects per million opportunities, this is the area left to LSL and right to USL.

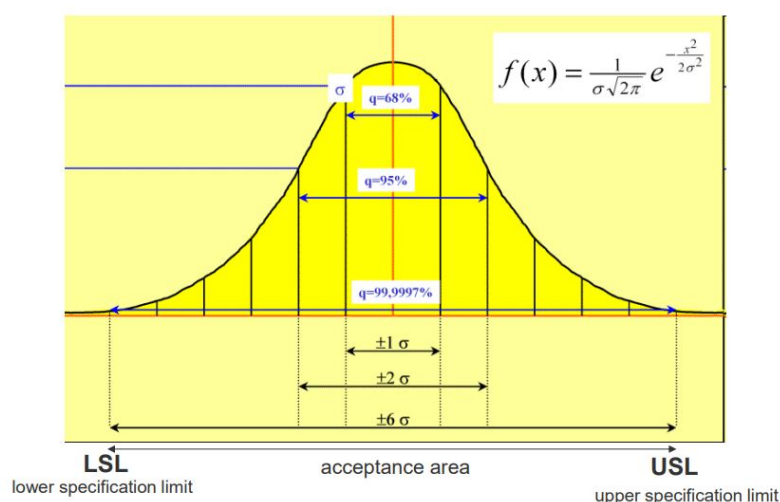


Figure 4: Six Sigma process

The basis for Six Sigma is the DMAIC cycle which is basically a modified PDCA process:

- Define (D): Setting up the project goals and team structure.
- Measure (M): Measurement of the initial process capability. In order to measure the process performance - in our case learning outcomes - LSL (lower specification limit) and USL (upper specification limit) must be defined. In Six Sigma, any performance outside LSL and USL should be an extremely rare event. LSL and USL can be easily defined based on the business rules specified in Table 2. The boundaries defining insufficient performance (e.g. DnM  $\geq 20\%$ ) can be customized, if needed.
- Analysis (A): In case of insufficient performance, the teacher and AoL must identify the root cause(s) for the bad performance. This is the key task of Six Sigma, which is the precondition for establishing improvements. For the LSCM module assessment we observed, that the main reason for bad performance of one trait was the insufficient understanding about specific quantitative methods in supply chain management which made a CI necessary.
- Improvement (I): Within AoL, all concrete actions applicable within the CI / SI portfolio can be used, like adding more material, replacing and deleting content, adapting rubrics etc.
- Control (C) Once, actions regarding CI / SI are implemented, one should ensure that the better performance continues as long as possible. For that purpose, direct and indirect measurements can be used in AoL to monitor the current performance by integrating different stakeholders like students, alumni, review boards, employers etc.

One key advantage of using Six Sigma is that the current and targeted process performance is easily made visible via a "number". The DMAIC cycle is very similar to the classical PDCA approach, however, especially for the "M" and "A", a considerable number of proven mathematical and statistical methods are available in the Six Sigma toolbox. As described in the approach of Adeinat et al. (2022), Six Sigma is often extended to Lean Six Sigma (LSS). LSS implies the usage of lean management techniques (i.e. cost cutting, avoiding waste) while guaranteeing a world class performance at the same time. For our AoL process, LSS would be an interesting extension. One could imagine applying lean management by avoiding unnecessary measurements or improvement steps or by collecting and implementing CI / SI appropriate for usage across program boundaries.

## 5. Summary and Outlook

In 2014, the management of the School of Business at the FHNW decided to set up a strategic project to achieve the AACSB (Association to Advance Collegiate Schools of Business) accreditation to sustainably secure the role among the best business schools.

The aim of this paper is to give an overview of the status of the implementation of the AoL process in the WI / BIT programs. Within the AACSB framework, AoL ensures to meet program learning goals and thus is an integral part to promote quality assurance in teaching. The AoL IT infrastructure at the FHNW essentially consists of linked MS Excel files and MS Power BI for visualization. The AoL process and assessments were illustrated using three WI / BIT modules.

The results achieved within AoL confirm the previous "feelings" of the lecturers and now allow improvement steps via CI / SI in a fact-based manner. The implementation of AoL at other universities shows above all that support from university management, professional project organization and effective stakeholder management are necessary to guarantee a sustainable improvement process. The implementation of AACSB requires "stamina" from the employees, so an accompanying concept for organizational development is essential.

Regarding the further development of AoL at the FHNW, there are mainly two opportunities.

- On the one hand, the existing IT infrastructure must be further developed in order to simplify the creation of assessments and evaluations. The existing MS Excel solution is increasingly reaching its limits here (number of registers, susceptibility to errors in links, etc.).
- On the other hand, it is important to optimize the exchange of improvements across program boundaries. The accompanying Curriculum Committee offers an excellent opportunity for this. IT-based measures could be something in the construction of an AoL-integrated lessons learned database.

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***Resilience Embodied in Conversations and Creativity During a Covid Context***

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**Abstract**

Many working-class, disabled, mature women face great adversity in the academy in their (in)ability to play the game. Lacking the necessary cultural capitals to feel at home in the spaces of higher education, the women returnees describe themselves as interlopers in the education machine. Yet this positioning was overcome in a collective community of creative resilience. It was one outcome of the author's doctoral research at the institution in which the research was conducted, the University for the Creative Arts. Here the presentation of post-structural and postmodern lecture programmes encouraged new ways of knowledge production and meaning making. Again, this exploration of resilience was considered during the pandemic, as conversations between the researcher and the participants saw their resilient subjectivities changing. The physical containment in lockdown provoked new and innovative transformations in learning and development. Whilst a creative resilience prevailed, the confinements and constraints of freedoms were not without their challenges to their mental health and well-being. This paper explores the multiplicity of resiliencies as the women navigated their way in and now outside the academy in a covid context. Conversations continued as the artist-educator subjectivity triumphed during adversity in creative forms.

Keywords: Creativity, Covid, Education, Artist As Educator, Marginalisation, Representation, Ethnicity, Conversations

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## Conversations to Introduce Creative Resilience

Many people belonging to minority groups, for example, Black, Asian, LGBTQI+, disabled and working-class, have difficulty finding their way in the university's masculinised, Eurocentric landscape (hooks, 1990; Jackson, Malcolm, & Thomas, 2011). Callendar and Melis (2022) discuss the disadvantages class places upon access and choice. This was the case for me and a group of first-generation university students who became part of my PhD research (Hayward, 2019). The research explored multilayered, and intersecting roles, performed in and outside the academy, as students, support workers and as what Clover (2010) terms 'artists as educators'. The context for this paper explores the significance of conversations and creativity over ten years including the recent covid pandemic and the post lockdown landscape. Considered are the embodied lived experiences and conversations as the resilient learner-artist-educator; this is despite a lack of representation in the academy and emotional and academic support (Finnegan & Merrill, 2017; Reay, 2017).

Entering the academy during the early 21<sup>st</sup> century, as mature, neurodiverse, working class women, we encountered great adversity in our (in)ability to 'play the game' (Bourdieu, 1985). We failed in the traditional pathway from school to university, as working-class teenagers. In a contemporary consideration of Pierre Bourdieu's (1985) notion of acquiring social and cultural capitals, we did not 'fit in'. Academics such as Diane Reay (2017), Liz Hoult (2012) Kerry Harman (2017) and Sue Jackson (2004; 2009; and 2012) expound upon marginalisation in higher education and are called upon in this paper to understand the complexities of resilience. As Jackson discussed at this very conference eight years ago, non-traditional students are required to fit into the existing structures and systems. And this is not without huge emotional distress and pain, and what Reay calls the 'inferior other' (2017, p. 101) or 'outcasts on the inside' (Bourdieu and Passeron, 1977).

Barely, playing the game, because as Hoult (2012, p. 97) explains in *A Winter's Tale* (2012), 'being in exile in a hostile land' the rules were neither known nor explained. We did not know how to research, read the right books, or write in that elusive third person. We could not speak the language of a 'mastery' discourse (Cixous, 1975). Yet this positioning was overcome in a 'collective community' of creative resilience (Clover & Stalker, 2007; Wenger, 1998; and Jackson, 2012). It was one of the outcomes of the doctoral research at the institution in which the research was conducted, the University for the Creative Arts (UCA). For this paper I draw upon the women's feminist interconnectivity and community of aesthetic praxis. This collaborative approach is an example of where 'resilient learners recognise, withstand, and negotiate the tension between inclusion and exclusion' (Hoult, 2012, p. 96). It is a psychological space in which much is made possible in a landscape of support and caring for the self and others.

## Conversations Past: Resilience Created

To begin, in this conversation I wish to take you, the reader, back to a powerful film, inspiring my own transformation and mobilisation of resilience, *Educating Rita* (1983). The struggles and difficulties of Rita are clearly visualised in the film by showing Rita as a woman straddling two cultures, albeit with 'painful compromises', (Reay, 2017, p. 101). Yet, seeing difference, whether class, gender, disability or ethnicity, is necessary for those marginalised groups to believe in themselves. I really thought that if Rita could do it, so could I. Accordingly, it is fundamental to see representation in the academy of different intersections within the student, and indeed the academic, body. Lewis Gilbert, Producer and



Director of *Educating Rita* realised that people of colour needed representation and understood this for students and academics alike. Gilbert considered adapting the film with Halle Berry and Denzel Washington, playing the lead roles. Their profiles were prolific at that time as both won Best Acting Oscars that year. Nevertheless, this conceptualisation did not materialise. *The Guardian* (2002) recorded that Gilbert said of his planned production: “There are so many good black actors in America. You only have to think of the two black actors who took the Best Actor awards at this year's Oscars”. With a black cast on the big screen it might have encouraged people of colour to apply to the academy as students and positions that might influence a career pathway to think they can be teachers, lecturers and managers. It was a shame that the remake was abandoned for this invisibility, which compounds the struggles of those trying to enter the physical and psychological space of the academy.

Thus, entering the space of the academy is a process that is challenging, but the physical obstacles, such as childcare, finance, travel and time constraints are not the only barrier. Winning, succeeding in the academy is hindered by the psychological fears of failure and embarrassment. This metaphor of struggle is clear in Rita's experiences of attempting to enter the academy, as she forces her way into Frank's office. She struggles to open Frank's study/office and trips up as she finally forces open the door. However, there is a resilience already present in order to make that initial step into the university. There is a curiosity to know and understand the cultures of academia, the canons of literature, music, art etc. Nevertheless, the landscape is complex, and Rita is an example of what Reay terms, an ‘outsider within’ (2017, p. 127). Frank explains what is necessary for her transformation:

Look, there's a way of answering examination questions that is...expected. It's a sort of accepted ritual. It's a game, with rules. And you have to observe those rules. Poets can ignore those rules; poets can break every rule in the book; poets are not trying to pass examinations. But Rita, you are. And therefore you must observe the rules (Act One, Scene Three).

Interestingly, where this scene was filmed, Trinity College, was for a time the place at which one of my research participants studied languages. She explains her experiences of education:

I fell in love with this building, Trinity College, in Dublin and I used to drive pass on the bus. I could see all these people walking around and I would just think – that's the place to go. ... But I left after two years. I don't regret having gone there. ... by the time I'd got to that age I wanted to go to art school. Now, I think I'm doing the right thing [a support worker, working in an arts university, UCA] (Interview, 2016, in Hayward, 2019).

Thus, the psychosocial elements of the individual, that is the internal and external self, need to be aligned. Like Rita, access was opened up for the participants at UCA. They studied courses in the arts. The Open University accepted me, and it was Professor Sue Jackson who gave me a chance to make a difference to my life in 2014. She supervised my master's dissertation at Birkbeck and encouraged me on my doctoral journey. That same year she was the Co-Chair for the conference for which this paper was written. In conversation with Dr. Joseph Haldane, IAFOR's Executive Director, she discussed the transformative power of education (Jackson 2014, YouTube). She encouraged dialogue between the themes of the conferences, past and present. In the vein that Sue advocated I wish to revisit the theme of that year, transformation in conjunction with resilience.

She was a change agent at Birkbeck and also in my own life as a student and educator. She rightly points out that often those in education assume that access is a seamless transition from compulsory education to university. It isn't. Lacking the necessary cultural capitals to feel at home in the spaces of higher education, the women returnees and I describe ourselves as 'interlopers', 'imposters' in education's neoliberal 'machine' (hooks, 1994; Cixous, 1975). But feeling at home, whether in a physical or psychological space is contingent upon how safe those spaces feel to the individual. We did gravitate to those post-1992 universities that seemed less intimidating. In thinking about my embodied journey of resilience, I realised that this transformative journey began in earnest in 2012. Starting an MSc in Gender, Sexuality and Society, it was and is the lived experiences of the women and their agency in the choice of motherhood, care-giving activities and a career (Harman, 2021), that is of value and what inspired my motivations for my research.

Revealed were the embodied conversations about resilience, resistance and representation; this spirit of comradeship facilitated a less painful journey for us (Hayward, 2022). To make that journey a bit easier for other minority groups one such way is to make visible our journey; the door of the academy was forced open to make the transformation to the artist-educator that we knew we could be. Then we must continue with an active visible approach of support for one another. At UCA the inclusion of post-structural and postmodern lecture programmes encouraged new ways of knowledge production and meaning making. We could really see the local othered groups in our art that we presented to each other. This connected resilience continued in the recent covid pandemic as we made a concerted effort to stay in touch.

### **Conversations Presented: A Collective Community**

In today's changing family and work dynamics, roles are complex, as the public/ private spaces are ambiguous and blurred. So as women make life-changing career and educational choices, different family dynamics are possible, specifically with the forced homeworking that has retained a post-lockdown legacy. Now there is a fluidity of the home, office, studio spaces, suggesting a possibility of development and change. However, the working woman finds it extremely difficult to manage a family and a career and study, especially without a network of support. The non-paid family labour of domesticity supports this exclusion, of many, from the workplace, obtaining a 'top job' and returning to education. For Bousfield (2000), non-paid family labour is defined as the 'abject space' and other theorists, Oliver (1997), Gilligan (1993) and Wolf (1999) eloquently explain this as the hidden unvalued labour of mothers carried out in the private sphere. And in a covid context, domestic abuse has been amplified as the private, for some, became a space of increased seclusion, so that violence was perpetuated. Traditional domestic 'spaces of femininity' remain, in the social structures from which women may feel oppressed, resentful and unable to leave in order to pursue a career or formal lifelong learning (Pollock, 2003).

'Habitual currents' are formed (Woolf, 1927) in a psychological styling of the psyche, and so patterns of behaviour are repeated to damage creative fulfilment. Rather than trying to explain this, I wrote an I-poem, which is the direct use of the interview data to construct poetry, entitled: *Unruly Women: our story as an I-poem*. This accompanied the exhibition discussed in the next section.

*Part 1: Habitual Currents*

In my head,  
I heard the teacher:  
Over and over:  
Over and over:  
YOU can't go to uni!  
You're too stupid,  
Stand behind your chair.  
Repeat after me:  
You'll be lucky to get ungraded.  
Repeat after me:  
You are thick,  
Repeat after me:  
You are stupid  
You can't be an auctioneer,  
You are a girl,  
You have a cockney accent.

No careers advice.  
I didn't really have any direction.  
I wanted to go to art college,  
But I was talked out of it.  
It wasn't a real profession.  
It wasn't a real job.  
It was a hobby.  
I wasn't good enough,  
Do you know -  
Like, you are good,  
But not that good.  
I didn't get many qualifications,  
But art.  
But there was no money,  
In art.  
There's no money,  
In that, to do a job.

Do you know what I think I am missing?  
The ambition gene.  
Careers advice?  
I would say was a bit poor on the ground.  
I remember that there was a table,  
With leaflets.  
There were a few:  
I would say nursing,  
There were the banks,  
There was insurance,  
And teaching  
I really wanted to go to art's school,  
But all the leaflets,  
Were pretty gendered really.

She is capable of more than that –  
 Make her go and do something else,  
 And she can draw in her spare time.

In the ECE 2014, Jackson stated this situation is driven by ideologies that are still reproducing knowledges that ‘promote the dominant Western paradigms’ of traditional epistemologies (Jackson, 2014, YouTube). These are imbedded within both the psyche of the individual and society at large (Walby, 1997, p. 5). Often placing working class women at the bottom of the employment hierarchical ladder, looking up at the ‘glass ceiling’ (Gatrell and Cooper, 2007). Positioned in de Beauvoir’s (1997, p. 626) conceptualisation of the ‘Other’ in institutions and ‘organizations’ (Beatty, 2007, p. 34-56), it is up to us as individuals and as a collective to find non-hierarchical and democratic ways to critique these hegemonic beliefs (Jackson, 2012; Harman, 2017).

Accordingly, the space of creativity and transformation is delicate and fragile. Being physically locked down, creativity may be locked in. Whilst a creative resilience prevailed, the confinements and constraints of freedoms were not without their challenges to our mental health and well-being. Focus was lacking and the motivation to make became a struggle. Speaking to my participant group there was for some an overwhelming feeling of uncertainty, that caused a sense of anxiety. On reflection, for me this lack of focus was tied to my inability to concentrate for long periods. Yet, other areas developed: I wrote a book of poetry in lockdown, *Memories Made: An Anthology of Poetry in a Covid Context* (2021). Thus, this consideration of creativity and identity is not fix in a Cartesian state of totality; instead it is as Belsey explains (1997, p. 661),

the subject is ... the site of contradiction and is consequently perpetually in the process of construction, thrown into crisis by alteration in language and in the social formation, capable of change. And in the fact that the subject is a *process* lies the possibility of transformation.

Consequently, as the social and cultural changes are instigated by Covid, the subject is able to adapt, but not without the need for conversations with those communities of collaboration. In this strange and unhomely landscape that facilitated the vocabulary for prose, conversations between the researcher and the participants saw their resilient subjectivities adjusting. The physical containment in lockdown provoked new and innovative transformations in learning and development. Times are changing, despite patriarchal ‘gender stereotypes’ (Beatty, 2007, p. 34). There is a huge amount of opportunity in which roles in partnerships and collaboration can be explored and negotiated (Hughes, 2002, p. 14). Accordingly, women artists as educators are in a continuous state of performance, negotiating and redefining identity and their place in society. There was a shift, in the function of the home, as the women were once more established in the private sphere, making, creating.

Post lockdown we became the ‘visible and public presence of women’ (Huyssen 1986, p. 62). In our exhibition *Unruly Women*, we actively discussed our work during covid and in conversation with the public during the exhibition. The once masculine space was now home to unruly women, and thereby denying, Plato through to de Beauvoir and onto Derrida’s, binary oppositions between the nature/feminine and culture/masculine (Huyssen 1986, p. 62). Normative masculine and feminine characteristics were confused, destabilised and subverted, as we became a confident collective body of positivity visualised in public/cultured spaces.

Covid facilitated this move in the landscape; as mature women our childcare duties were replaced with creativity. In contesting the dominant ideology of woman as mother and primary care-giver an alternative is given. The alternative of a 'top job' or artist, curator, forces the viewer to rethink the role of social and biological mother (Betterton, 1996, p. 11). However, I am not negating woman as mother, but offering alternative family, work and pedagogic dynamics. The stereotypical active 'male bread winner' and the passive 'stay-at-home mother' are a site that our exhibition problematises. The gendered roles are no longer easily defined as they change in accordance with the social relations and environmental changes in which the role is in acted. Society needs to support the choice that the individual makes in the private and public spheres, to facilitate possibilities and transformation (Clover and Harman, 2022).

### Conversations for The Future

Having endured years of feeling our opinions were not valued, the margins are a space from which resistance is possible. and we showed ourselves to be resilient learners, educators, artists, possessing the ability to transform by supporting each other to visualise a creative resilience (Clover & Stalker, 2007; Wenger, 1998). 'Resilience is what breaks the chain of endless reproduction in an education system that rewards the rich with ever more capital' (Hoult, 2012, p. 103). Conversations are continuing as the artist-educators whose subjectivities triumphed during adversity. And by supporting and caring for one another, this paper shares with you, some of that abundant creativity. To view some of the images we created for the *Unruly Women* Exhibition they can be found on Twitter, and the panoramic photograph I took in situ. I will end with the second part of the poem that sums up our resilience in the conversations we had. At the exhibition, in conversation with a current student from UCA, she said that it was a representation of how she felt and should be used in schools as a learning tool.

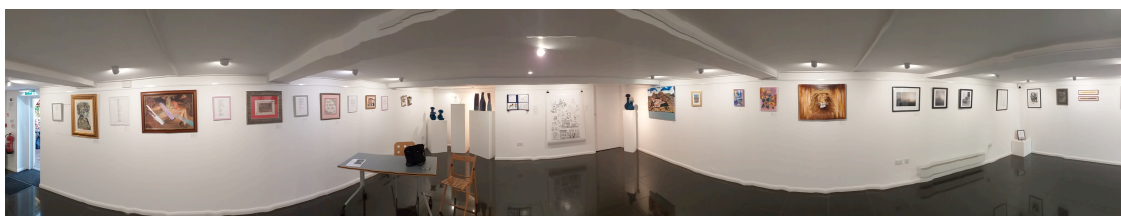


Fig. 1: *Unruly Women*, 2022 at the Nucleus Gallery Chatham, Kent. Photograph by Beverley Hayward, from left to right, featuring the work of Beverley Hayward, Jackie Hagan, Carole Hatfield, Chrissie Peters, Vickie Lane and Luna Zsigo.

### *Part 2: Flying Above and Beyond*

I now consider myself to be an artist.  
 I feel it has helped me  
 Inspire young people,  
 To achieve their dream  
 And be creative.  
 I want to inspire people,  
 To not stop being creative.  
 So, if they are in an art's uni,  
 Like they are not there for nothing.  
 It doesn't matter what they do with art,

As long as they recognise,  
That they are creative,  
As I am creative,  
I can encourage.

I liked ceramics.  
I liked the woodwork.  
And I like making anything,  
I've never really settled,  
I'm a multimedia artist.

I am an artist.  
Helping people.  
Well if anyone's in need,  
Then I seem to be there,  
At the right time.  
So, if I can help,  
In any way,  
To get them through,  
To the next stage,  
Even in the background.  
You know I think,  
Art should be fun.

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***Higher Education and Graduates' Unemployability in Nigeria: The Policy Implication***

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**Abstract**

The deficient possession of relevant employability skills that have rendered many graduates unemployable in Nigeria has been a subject of national discourse among the policy makers in education in Nigeria in recent times. Graduates' unemployability poses serious psychologically imbalance on the concerned persons while economic growth of the country is adversely affected. This paper focused on higher education and graduates' unemployability in Nigeria: The policy implication. Apparently, what employers of labour are looking for in the graduates to fill job vacancies include academic qualifications, required skills, and personal characteristics. Nevertheless, employers of labour reiterated that some of Nigerian graduates though possess required qualification but do not have essential skills that will qualify them to be employed. From the available literatures, these skills include: communication, critical thinking, decision making, information technology, interpersonal, problem-solving mechanism, self directed learning, technical, numeracy and analytical and problem solving skills, entrepreneurial skills among others. This study considered Harry Jerome's structural unemployment theory. It was suggested for the policy makers the need for the adoption of internship intervention programme into the one year mandatory National Youth Service Corps (NYSC) scheme, in order to furnish the teeming graduates coming out on yearly basis from various higher institutions in Nigeria with the required skills to make them to be employable, and this was represented with a model.

**Keywords:** Higher Education, Employability Skills, Structural Unemployment Theory, Employers of Labour, National Youth Service Corps

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## Introduction

Globally, higher education has been seen as a potent instrument for human capital development and empowering citizens. One of the motives of establishing higher institutions are to turn out high level manpower that is knowledgeable, skilled, self-reliant and relevant to the needs of the labour market. Corroborating this assertion, Idogbo (2011); Aselebe, Popoola & Oladiran (2016) stressed that tertiary education is to developing human being mentally, morally worthy in character and learning to enable them perform leadership roles in the society they find themselves.

There is no iota of doubt about the fact that Nigeria as a country is blessed with high number of higher institutions, whereas, in terms of human resource development, the rating is abysmal. Adadeji and Oyebade (2016) stressed that Nigeria was ranked 114<sup>th</sup> out of 140 countries surveyed rating their manpower development, and 106<sup>th</sup> in technological readiness, with five years as the mean number of years of schooling.

Over the years, it is evident that Nigerian tertiary institutions produce thousands of graduates into the labour market on yearly basis, and the bottom line in this situation is that insignificant percentage of the output is able to secure available jobs, and this poses a great danger in the land (Educational and Employability Survey Report, 2014). Graduates' unemployability has become a continuing subject of debate of policy priority for higher education policymakers in Nigeria in recent times and this due to a great difference between the output and number of graduate secured employments (Edinyang, Odey & Gimba, 2015; Olaniyi, 2017). Omoniwa and Adedapo (2017) see employability as an individual's capacity and willingness to become and remain attractive in the labour market. Also, it involves the individual's competence to be successful in a great diversity of jobs.

The perception of employers of labour on the capabilities and functionality of graduates in Nigeria in recent time reveals that characteristics such as analytical skills, good communication skills, good personal and social skills, technical and managerial skills among others are missing in the graduates which are turned out into the labour market on yearly basis (Anho, 2011; Akinyemi, Ofem & Ikuenomore, 2012; Kakwagh, 2013; Oni, 2014). Currently, the reflection of output from tertiary education in Nigeria indicates that some of them do not have needed skills that enhance their chance of gaining employments, and this led to continuous increase in the rate of youth unemployment (Phillips Consulting, 2014).

Uzochukwu (2015) quoting the figure from National Bureau Statistics (NBS) confirms that not less than 5.3 million youths are jobless in Nigeria, while 1.8 million graduates enter the labour market on yearly basis. Also, Edinyang, Odey and Gimba (2015); Balogun (2016) reiterated that the alarming rate of unemployment among Nigerian nation is experiencing is as a result of snowballing effect of increasing output from higher institutions and could not secure job opportunities. Longe (2017) opines that graduate unemployment is a cankerworm hindering economic vastness and developmental aspirations of the nation.

The track of graduate unemployment in Nigeria show that it rose from 1% in 1974 to 4% in 1984. Dabalen, Oni and Adekola (2000) stress that between 1992 and 1997, unemployed

labour force rose to 32% in the country. The unemployment trend in Nigeria had steadily moved from 21.1% in 2010 to 23.9% in 2011, 24.3% in 2012 to 28.5 in 2013, also, it risen from 30.0 in 2014 (Innocent, 2014). It is indicated that a total of 52million citizens within the economically active population of Nigeria are jobless, and mostly, newly qualified graduates took larger percentage (National Bureau of Statistics, 2016). Also, according to National Bureau of Statistics (2020) labour force survey, Nigeria's unemployment rate was 27% in Q2 reported in Q3.

Inferring from the statistical analysis above, it is evident that Nigeria as a country could not provide employment opportunities for the output from her tertiary institutions. According to Obanya (2004), the mandate of Nigerian higher institutions is to produce graduates with attributes such as analytical power, communicative skills, problem solving ability, team spirit, creativity, versatility and lifelong learning skills that will aid national development.

In a study conducted by Omoniwa & Adedapo, (2017) certain skills that employers of labour take cognizance of while offering jobs to prospective graduates seeking employments in Nigeria. are: good reading/writing skills, analytical and problem solving skills, data analysis and interpretation, self-confidence, computer skills, sector specific skills, communication skills, knowledge about other fields, and so on.

Olaniyi (2017) found out that the reasons why many Nigerian tertiary institutions graduates could not get job were due to the fact that they lack skills and personal attributes as requested by the employers of labour despite the fact that they possess excellent qualification. According to him, the skills required of graduates to make them employable include analytical/ research communication, critical thinking, decision making, information technology, interpersonal, problem solving, self directed learning, technical, numeracy and entrepreneurial skills.

In the opinion of Shadare and Elegbede (2012), factors such as defective manpower planning and expansion of educational facilities that have unjustifiably raised the expectations of Nigerian youths, the economic recession, continued offering jobs to expatriates, wide rural-urban migration, among others are the major factors responsible for graduates' unemployment in Nigeria.

Another reason why many Nigerian graduates could not secure job opportunity is issue of academic discipline. Graduates of certain departments have higher chances of being selected for jobs than their counterparts in some other disciplines. For instance, a graduate of Education/Accounting has a greater advantage than a graduate of pure accounting because the former can perform the tasks of an accountant and of an educationist at the same time. In the study carried out by Edinyang, Odey and Gimba (2015) revealed that academic disciplines significantly influence employability.

Previous studies had looked into assessment of graduates employability, academic factor and graduates employability and so on while there is dearth of literatures on graduates' unemployability. However, most of the available studies were carried out outside Nigeria. Therefore, this study examined higher education and graduates' unemployability in Nigeria: The policy implication.

## **Theoretical Framework**

This study considered Harry Jerome's structural unemployment theory. The theory emphasizes the role of investment in education as a tool for accelerating economic and social achievement. Also, the theory takes cognizance of training as mechanism for enhancing individual employability skills. This is supported by Kulkarni (2013); Halidu (2015); Aselebe (2019) who found out that a worker can be self-creative, intellectually sound by exposing to training programmes. Also, no organisation can achieve optimum productivity until the individuals have applied the required skills and knowledge.

## **Literature Review**

### **Higher Education in Nigeria**

This is the education given after Post Basic Education in institutions such as Universities, Inter-University Centers, Innovation Enterprise Institutions (IEIs), Schools of Health and Technology, Colleges of Education, Polytechnics, Monotechnics, Colleges of Agriculture and National Teachers Institutes (NTI) (FGN, 2013). The goals of higher education as contained in the National Policy on Education (2013) are to:

- (a) Contributing to national development through high level manpower training;
- (b) Providing accessible and affordable quality learning opportunities in formal and informal education in response to the needs and interests of all Nigerians;
- (c) Provide high quality career counseling and lifelong learning programs that prepare students with the knowledge and skills for self-reliance and the world of work;
- (d) Reduce skill shortages through the production of skilled manpower relevant to the needs of the labor market.
- (e) Promoting and encourage scholarship, entrepreneurship and community service
- (f) Forge and cement national unity; and
- (g) Promote national and international understanding and interaction

### **Graduate Employability**

Globally, there is no doubt that tertiary institutions perform important roles in generating human capacities for leadership, management and the technical expertise. They are places where specialized human resources are developed. Graduate refers to individual with any form of post matriculation qualification or tertiary diploma or certificate (Omoniwa & Adedapo, 2017).

Edinyang, Odey and Gimba (2015) define employability as the process of possessing competence to gain initial employment, maintain employment and secure new employment if required. He stressed further that employability depends upon: assets in terms of understanding, skills and behaviours; showcasing potentials someone endowed with to the employers.

## Towards Reducing Graduates' Unemployability in Nigeria: The Policy Implication

The phenomenon of graduate unemployment has reached a disquieting level in Nigeria (National Bureau of Statistics, 2020). The effect of this unwholesome development on the nation's economy and the extent to which it has affected individuals are highly immeasurable. Okolie, et al. (2019) advocated that stakeholders need to pay much attention to generic skills in graduates so as to contribute greatly to the development of industries in Nigeria. Oladokun and Gbadegesin (2017) found out that inability of many Nigerian graduates to secure jobs is linked to lack of essential skills as demanded by employers of labour.

The NYSC scheme was created by decree No.24 of 22nd May 1973 for proper encouragement and development of common ties among the youths of Nigeria and the promotion of national unity. The scheme is designed primarily to inculcate in Nigerian Youths the spirit of selfless service to the community, and to emphasize the spirit of oneness and brotherhood of all Nigerians, regardless of cultural or social background (NYSC, 2017).

The establishment of NYSC is a good and welcome development. However, this can further be strengthened through inclusion of internship programme into it to enhance the required skills of the graduates being turn out of higher institutions on yearly basis. A model below reflects how graduates could be furnished with the required skills to make them employable in Nigeria.

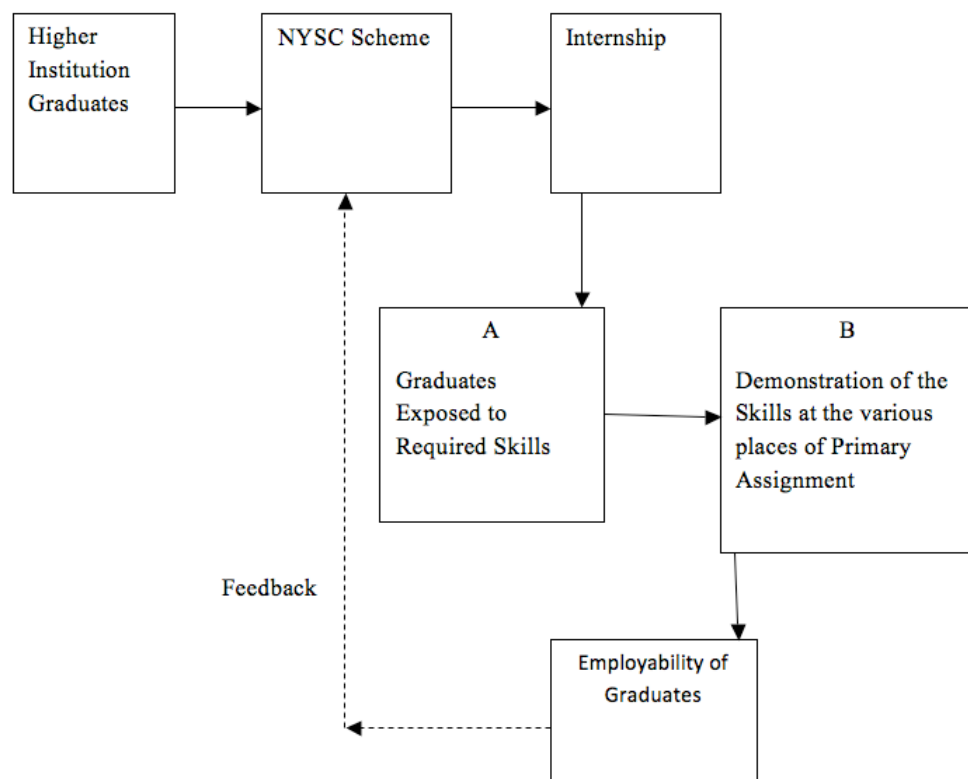


Figure 1: INTERNSHIP EMPLOYABILITY SKILLS ACQUISITION MODEL  
Source: Researcher's Concept

Application of the above internship programme as contained in the model involves two stages. At stage A, participants (graduates) are expected to be exposed to the various skills. Also, at stage B, participants are expected to be posted to various places of work so as to demonstrate the required skills such as data analysis and interpretation, Good reading/writing skills, self-confidence, computer skills, sector specific skills, communication skills, professional certification, knowledge about other fields, analytical and problem solving skills they have been familiar with. Assessment will be carried out in this regard in order to know the extent to which such skills have been acquired for employability.

## **Conclusion**

Graduates' unemployability in Nigeria has become a subject of discourse among stakeholders. Employers of labour are complaining that the quality of graduates coming out of higher institutions indicates that some of them lack the requisite skills for employment. The need to review the modus operandi of NYSC scheme to include internship intervention to improve the required skills of teeming graduates call for urgent attention.

## **Policy Implication**

Based on the model above, the under listed are suggested for the policy makers:

NYSC scheme should be reviewed to include internship intervention, so as to furnish the Nigerian graduates with the needed skills requested by the employers of labour.

NYSC agency should make it a mandatory exercise to expose all corps members to various skills such as communication, critical thinking, decision making, information technology, interpersonal, problem-solving mechanism, self directed learning, technical, numeracy and analytical and problem solving skills, among others as demanded by employers of labour.

NYSC management should create enabling environment for the corps member to put into practice all the required skills so as to qualify them for job opportunities, and assessment should be continuously carried out all through the time of their primary assignment.



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### ***Teacher-Targeted Bullying by Secondary School Students***

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#### **Abstract**

The aim of our study was to gain insights into the teachers' targeted bullying from the perspective of teacher victims. We conducted a descriptive qualitative research design stemming from semi-structured interviews with the victims of teacher-targeted bullying. A thematic content analysis of the data was generated from interviews with 17 victimized teachers as a snowball sampling. The sample consisted of male (n=5) and female (n=12) participants from school locations in Prague, Czech Republic. The focus of our study was to determine how the teachers who had been experiencing bullying by their students described and perceived the nature and consequences of bullying. The findings indicate that the victims of teacher-targeted bullying were exposed repeatedly over long time to verbal and nonverbal attacks, ignoring and other threats directed against teachers. Our results prove bullying had a negative influence on the victims' private lives (family, colleagues), physical and mental health and self-esteem.

Keywords: Teacher-Targeted Bullying, Students, Secondary School

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## 1. Introduction

Teacher targeted bullying is a complex and multi-faceted problem. It is a underrecognised and underresearched topic, most probably due to its sensitivity. It is defined as “a communication process that involves a real or perceived power imbalance where a teacher is subjected, by one or more students, to interaction that he or she perceives as insulting, upsetting or intimidating; this may be verbal, nonverbal or physical in nature, it may be premeditated or opportunistic, be a single instance or recurring and or of short or long duration” (Kauppi and Pörhölä, 2012, Billet, Fogelgarn, Burns, 2019, 8, Koiv, K., Aia-Utsal, M, 2021).

Bullying and harassment of teachers means any unwanted student behaviour that makes teachers feel intimidated, degraded, humiliated or offended. It often happens in class in front of the eyes of other students. It may be persistent or an isolated incident. Although it often occurs face-to-face, it can also occur in written communications, by phone, via email or on social media.

Experimental data show some teachers are bullied daily by students (or by their parents), they experience the kind of harassment that would be deemed unacceptable in most workplaces. They report both physical and verbal threats and abuse.

Student-to-teacher bullying and harassment has been even recorded in countries such as Taiwan, where students are taught to revere teachers, and in Finland, where the teaching profession is well regarded. Verbal aggression seems the most common form of bullying. Nearly 30 % of respondents recorded a student having sworn at them in the last 9 to 12 months, closely followed by yelling (28 %) and disparaging verbal comments (25.5 %). Around 10 % of teachers had been hit or punched by a student in the last year, 12.5 % had a student damage their personal property and 16.6 % had a student stand over them or invade their personal space. Female teachers experienced student bullying and harassment more often than males – 71 % to 68.4 %. Female teachers were more likely to experience students standing over them or invading their personal space (9.9 % to 6.9 %), as well as students harassing them through phone calls or text messages (2.3 % to 1.4 %), (Bojcic, 2019).

The focus of this study is on the forms in which the bullying of school teachers by students manifests itself, the characteristics of the students who engage in the bullying, and the manner in which the students who engage in bullying behave in their own peer relationships. The data was gathered from secondary school teachers by means of an Internet survey. The answers of 17 teachers who had experienced bullying by their students are examined. The teachers had been exposed to different forms of bullying. They had typically been bullied by male students. In most cases, the bullying had been perpetrated by an individual student or a small group of students. According to the teachers' assessment, the majority of the students who bullied them also bullied their fellow students (Kaupi, Porhola, 2012).

## 2. Methodology

### 2.1. Research design and sampling

Our study followed a descriptive qualitative research design. Selection of the participants for this study was purposeful snowball sampling based on the sensitivity of the research topic. The sample consisted of male (n=5) and female (n=12) participants from a secondary

technical school and a secondary professional school. The mean age of the participants was 47 years, ranging from 32 to 59-year old. The average number of years in the teaching profession for the participants was 22 years.

## 2.2. Data collection

The questions were posed to the participants during the semi-structured interview based on questions developed from Pervin and Turner's (1998) measure of *Teacher Targeted Bullying* with focusing on participant's subjective experiences and perceptions in three areas – nature, influence and reasons attributed to teacher-targeted bullying. The participants were contacted individually and they agreed to participate in a semi-structured interview which was conducted in their school bureau. At the beginning of interview, authors discussed definition of bullying to reach clear understanding of the concept of bullying. Interviews were conducted until definite themes became evident and the information became saturated. Confidentiality of the teacher identity was expressed by researchers. Interviews lasted 45-140 minutes, they were audio-recorded and transcribed.

## 2.3. Data analysis

Thematic content analysis was used to analyze the data gathered through transcribed interviews, keywords, meanings, and themes were evaluated during the analytic process, data were segregated, grouped, regrouped, and re-linked in order to unify meaning and explanation. Both authors read and coded the transcripts and took part in consensus discussions to strengthen the study.

## 3. Research results

Based on the objectives of our research these findings emerged from the collected data.

### *Substance of the teacher targeted bullying*

Theme 1: Nature of TTB Characteristics of TTB Victimized participant teachers described bullying as "...a negative behavior that occurs repeatedly over time and causes distress" with characteristics of power imbalance between bully as a pupil and target as teacher. The aggressive acts against the teachers were described as intentional.

Teachers – participants of the interviews characterized bullying as intentional negative student behavior that occurred repeatedly over time and caused inconvenience to them. It was also characterized as a power imbalance between bully-student and target-teacher and was repetitional and long-lasting.

### *Forms of teacher targeted bullying*

The prevalent form of bullying as characterized by victims was **verbal** ("teasing", name calling, shouting, verbal imitation), **nonverbal** (gestures, threatening signs, mimicking, caricature and dirty looks), **behavioral** (e.g. walking out of class, damaging school supplies, ignoring class activities), **relational** (gossiping, whispering, spreading rumors). No cyber bullying was mentioned in our research sample though. Teacher targeted bullying took generally form of several manifestations of student disruptive behavior (breaking discipline rules in class).

## **The consequences of bullying behaviors as reported by most teachers**

“They increased my stress”

“They affected my health condition”

“They caused a bad atmosphere in the classroom”

“They decreased my expectations for students and for teaching profession”

“I had to modify my teaching methods”

“I started to hate some students”

“I decreased the number of activities I performed in the class”

### ***Social context of teacher targeted bullying***

Bullying became a group-based phenomenon in 3 cases as group of students repeatedly behaved in an adversarial way. Leaders of the peer group started bullying acts toward them to gain attention and gratification from other peers and to seek for support by bystanders in group context.

### ***Consequences for victimized teachers***

#### **Personality effects**

From the interviews with victimized teachers, it became clear that they often felt helpless, guilty, angry, humiliated in addressing acts of TTB. Also, negative outcomes for the participants were connected to negative career implications, with workplace and family stress. Many victimized teachers believed that their personal and work-related reputation and authority were damaged. The positive personal outcomes included a belief of respondents that the experience of taking effective action against the TTB had some personal worth or value for improving self-confidence and suggestions for future self-assertion strategies and skills to prevent or intervene in bullying incidents.

### ***Teaching practice and attitudes towards teaching***

Several participants were convinced their estimation of the teaching profession has changed as a result of their own negative experiences. They decided to use more passive teaching strategies and lowered their expectations in terms of behavior and teaching toward the learners who had been bullying them. As a result, they started purposely ignore misbehavior of bullies in the class.

#### **Motivation for TTB**

##### ***Motives connected with teacher personality***

The participants pointed at several personal traits connected with bullying - being either provoked or intimidated by the perpetrators showing personal vulnerability of the bullying expressed in different ways. In some cases, participants acknowledged that they can become easily irritated as some learners purposely bully them, and if they lose his/her temper it brings him/her into disrepute with the principal. Victimized teachers expressed the feelings of personal powerlessness describing learners who bully them intentionally trying to disempower them.



### ***Motives connected with student personality***

Negative attitudes towards teachers and schoolwork were sometimes observed in student perpetrator's behavior as students missed control over their learning outcomes. Boredom was also mentioned as one reason why learners bullied their educators. They found their studies pointless.

### ***Motives connected with student's family***

Parents' unwillingness to discipline their children and regulate their inappropriate aggression may encourage teacher targeted bullying. Victimized teachers mentioned that parents often reinforced bullying as they did not instruct children to take responsibility for consequences of their behavior. Parents did not admit that their child was doing something wrong, they claimed their child had been bullied by the teacher.

### ***Bullying and school and class social climate***

Sometimes, victimized teachers do not open up with being bullied with their colleagues or school management. It may happen in case of beginning teachers (five from our research sample). Four teachers from our sample confirmed that listening and care attitude of their colleagues with suggestions to discipline aggressors helped them understand the situation and find self-management skills to trickle with bullying. Three teachers said they received no support from their colleagues and school management helping them to manage with bullying incidences (e.g. by changing the class they teach).

## **4. Conclusions**

We summarized and structured data generated from personal interviews with seventeen secondary school teachers who had been bullied repeatedly and over long time by some of their students. Different forms of bullying were reported by victims: verbal („teasing“, name calling, shouting, imitating), nonverbal (gestures, threatening signs, mimicking, caricature and dirty looks), behavioral (walking out of class, damaging school supplies, ignoring class activities), relational (gossiping, whispering, spreading rumors). Misbehaving students were perceived as intentionally challenging the teacher's authority in order to disempower them. Teacher reported that effects of being bullied were long-lasting.

Motivation for teacher targeted bullying as suggested by teachers was connected with their own personal traits (vulnerability, lack of assertion, inexperience), students' personal traits and attitudes (no interest in learning, feelings of boredom, effort to attract attention of peers), family background (parents' aggression and unwillingness to discipline their children).

Teacher experiences with bullying undermined their self-confidence and self-esteem and had negative impact on their physical and mental health (sleep disorders, headache, digestive disorders). Negative experiences influenced their teaching methodology: they tended to use passive teaching strategies and lowered their learning outcomes expectations.

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### ***Practical Teaching in Times of a Pandemic***

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#### **Abstract**

This communication seeks to reflect on teaching, particularly graphic design in a time of pandemic (covid-19). The challenges that were unexpectedly posed to teachers, who were forced to change the way of teaching from face-to-face to virtual from one moment to the next. The facilities and difficulties that both, the teacher and the students, felt throughout their classes. Since the Bachelor's Degree in Design and Graphic Production at ISEC Lisbon is essentially practical, it is interesting to understand how the adaptation was carried out. The main advantages of distance learning are the possibility for people who are isolated and infected with Covid-19 to be able to attend classes. Also, there is the opportunity to share works and ideas among colleagues by displaying them on Zoom (during the presentation). However, without the guarantee that all students are watching, as the presence of colleagues is not as evident as in face-to-face teaching, students feel more comfortable, which allows the presentation to run better.

Keywords: Graphic Design, Pandemic, Teaching, Distance Learning

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## Introduction

The Covid-19 outbreak was first identified in December 2019 in Wuhan (China) and has affected different fields globally, namely economic, political, social, and educational. "The COVID-19 pandemic reminds us that in times of turmoil, decisions made for the greater good can have collateral impacts. It's becoming evident that efforts to contain the virus and limit social distancing are increasing precarity for some people, especially those already in socio-economically disadvantaged positions" (Eve-Marie, 2020).

Due to the pandemic (Covid-19), the blocking measures and social distancing in most countries have led to the closure of schools from primary to higher education. By mid-March 2020 about twenty European countries had schools (public and private) completely closed, with different measures taken in different countries. The goal of closing schools was to try to minimize contact between students and consequently reduce the number of cases. However, with the closing of the schools it was also seen that the existing socio-economic disparities between students increased: "yet, as is becoming apparent to education professionals like me, the digital divide exists among our students, and, like everywhere else, it reflects deeper socio-economic, gender and race inequalities. Existing disparities influence who are the "haves" and "have-nots" of information and communication technology" (Eve-Marie, 2020).

The shift from face-to-face learning to online learning has inevitably brought many questions about teaching, making technologies even more present in school activities. "After all, the context of work-from-home is far more daunting than working from a segregated space meant only for professional work... There is always an iota of uncertainty associated with the online mode. More often than not, the classroom on the computer screen is a dead board with dots showing only the first alphabet of each attendee's name. Even the teacher has to turn the camera off to ensure longer hours of smooth Internet connectivity... A few of them log in right at the beginning of the class, keep the camera and mic off throughout, and stay on in this 'unheard-invisible' mode until the end of the class. Some of them return to the class towards the end, turning on their mic to say a few things to register their presence" (Pathak, 2022, p.65). Teachers had to use software daily that was only used sporadically, and these tools are essential for teaching remotely. The transition from face-to-face teaching to remote teaching was a completely different experience for some students and teachers, forcing them to adapt quickly because there were no alternatives and because it was a legal imposition (prohibition of face-to-face classes). The educational system and the teachers adopted "emergency learning" through various digital platforms and were forced to adopt a system that nothing (educational system) and no one (educational leaders, teachers, and students) was prepared for.

## Description of the presential and remote classes

The aim is to analyze how the classes of Introduction to Design and Design I - Graphic Design at ISEC were, curricular units of the degree in Graphic Design Production, referring to the first year, in the first and second semesters in the academic year 2020/2021.

A summary of the curricular plan of these two curricular units will be made, to better understand the practical constraints that exist, and then the exercises that were developed in the school year 2020/2021 will be synthetically described.

The curricular unit of Introduction to design seeks to prepare students for the area of design exploring its connection with economic, political, social, and technological aspects. Its objectives are

- Sensitize the student to the need for prior and critical analysis of the contexts in which design intervenes; the importance of drawing, as a means of visual reasoning and exploration of ideas; the descriptive memory, as support for self-criticism and an instrument of awareness throughout the project; the construction and analysis of models and prototypes; sustainability and inclusion; moral, ethical, deontological and legal issues applied to Design.
- Promote and develop skills of communication and discussion of ideas; synthesis and visual communication; application of problem-solving methodologies in Design; and present / make known the notion of social responsibility; stimulate experimentation as a technical development;

The curricular unit of Design I - Graphic Design aims to continue the knowledge acquired in the curricular unit of Introduction to Design. Its objectives are:

- Develop skills in analysis, planning, and execution in projects of graphic and communicational scope.
- It is intended that in each project the student makes use of research and exploration of their knowledge along with the information provided, thus enhancing their thinking, creativity, and critical combined with existing skills and those learned.
- Seek those students acquire essential skills to develop and manage graphic/communicational works, from concept creation to production planning.

The 2020/2021 school year started in October 2020 in a face-to-face format, and classes ran within the new normal, however, some classes had to be remote due to the need to put the class in isolation due to a student having had contact with someone infected with Covid-19. At the end of January 2021, due to the pandemic state classes had to be all remote until February 9, 2021 (end of the semester).

The classes remained on the same schedule, however, because there were classes of four hours duration this period had to be adjusted to a maximum of two synchronous hours (virtual class) plus two asynchronous hours (autonomous class, in which the students continued to independently develop the exercises, assignments requested by the teacher). There were two weeks with remote classes in the first semester (with an average of three classes per class, classes that were missing to finish the semester). The students did the final work of the curricular unit and presented it to the class remotely.

The synchronous (remote) classes had a maximum duration of two hours and consisted of classes for the analysis and development of the final work as well as clarification of students' questions. During the class, each student presented his or her work, and the teacher and classmates gave constructive criticism about the improvements that could be made to make the work more complete. These classes became interesting because everyone could see the work of their classmates, something that did not happen so often before. After all, in the face-to-face class, the teacher circulates the room (I mean from desk to desk) and talks to the

students in an individual/personalized way. In this sense, it allowed the sharing of ideas and different points of view, making the presentation enriching for everyone. It is considered that this sharing was an asset because there was mutual help and consequently the learning benefited. In these two weeks, it reinforced the possibility, for those who wanted, to send an email with the work developed for discussion (student and teacher) proposing improvements to be made. Only a few students did this, but those who did ended up benefiting from more constant monitoring, which resulted in enrichment not only for that work but also for future work since the knowledge remains.

As negative aspects we highlight the isolation of students (contributing to social isolation, with all the impacts that this entails); there were fewer social relationships among classmates; inability to deliver the physical work (paper/card), the work is usually printed by students to have a greater sense of how it would look if printed in real size. As well, throughout the development of the whole process they are also asked to make sketches, and prototypes, and to print what they are developing in digital format so that they are aware of how the final work would look like to be delivered to a client.

The second semester began on March 1, 2021, remotely and ran until mid-April 2021 for a total of six weeks, the class took eight classes during this confinement period.

The semester began with the presentation of the proposed contents for the curricular unit of Design I. As it happened in the first semester, this one was also a four-hour class (two synchronous hours plus two asynchronous hours). After the usual introductions of students, teacher, and the curricular unit, a first group exercise was requested (consisting of two to three people) which consisted of the research and analysis of a graphic image, later presented to the class. Also in this class, the students had to group and propose to the teacher the theme they wanted to analyze since all groups had to have different themes. It was interesting to see how willing and quick they were to organize themselves, by sending private messages in the program used for the remote class. Very quickly the groups were formed and the topics that would be presented in the following classes were found. Afterward, the groups were divided into independent virtual rooms to organize themselves and start developing the work.

The second and third remote classes were used for the presentation of the research done by the students, the research consisted in analyzing the graphic image of a product of their choice and for that, they should take pictures and analyze their choices. Something that was well received by the students who divided tasks among the group and each one photographed and analyzed a part of the work. These two classes consisted of presentations made by the students remotely, when a presentation was over their colleagues (students) were invited to ask questions and/or give their opinion about the analysis made.

The fourth remote class consisted of the teacher explaining the syllabus and presenting the second exercise to be developed individually, in which the research done in the previous exercise would be related, in the sense that it was a "preparation" for the second exercise.

The fifth remote class also began with the presentation of the syllabus, then the students spoke about the development of their work asking the teacher's opinion and asking questions they considered pertinent. It was interesting the critical analysis that was provided because everyone saw each other's work in development and could give their opinion about it. This sharing was very enriching because other points of view were approached that the student who was developing the work was not aware of. The weak point in this type of class is that it

is very demanding for students and teachers. Students end up getting bored with the time they wait until it's their turn to pose questions, that is, despite being invited to contribute with ideas/suggestions to strengthen the work of colleagues, it was felt that throughout the class their concentration faded, there were moments when they were not present (absences to go to the bathroom, the kitchen to drink water or simply because their thoughts were wandering), motivating students from a distance is a very demanding task for teachers.

The sixth remote class consisted in continuing the development of the work, i.e., it turned out to be a similar class to the previous one, with students who wanted to ask questions and/or show the evolution of their work, with everyone watching and whenever they wanted, they could intervene with their opinion to help their classmates.

The seventh and eighth remote lessons were used for the students to present their final work, each student presented and justified the choices of their final work. Also in this lesson, the statement of the next exercise was presented. These two classes were the last remote classes, later the classes returned to face-to-face, but not all of them were remote at the same time. As the curricular unit of Graphic Design is theoretical and practical, it was one of the first to leave distance learning and move to face-to-face learning. In this work that the students did remotely, there was a certain tolerance regarding the final result because if the same had been done in face-to-face classes it would have had other monitoring and students would naturally be asked to print the work presented to have a more realistic notion of the final result (we mean to understand what they would be delivered to an eventual client because sometimes something that looks interesting on the computer, when printed is not legible and/or the colors are different).

As of April 19th, 2021, the classes of the Graphic Design curricular unit started to be taught face-to-face within the "new normality", naturally respecting all the recommendations of the Directorate-General of Health.

Learning activities in higher education institutions have been significantly affected due to the pandemic of COVID-19. The education system around the world chose to use online teaching and learning during the peaks of the pandemic, rather than the traditional face-to-face classroom, to try to mitigate the contagion. In this context, facilitating better access to information and communication technologies has become increasingly essential.

The adaptation to the new teaching method was new, both for teachers and students because they had to adapt instantly, reinforced by the fear resulting from the uncertainty of what might happen in the future (it was something never experienced before, in fact, it was transversal, taking the world population by surprise [including virologists, epidemiologists, and scientists], all sectors of society were affected). The uncertainty and apprehension about the future remain worldwide, due to the constant emergence of new variants of the virus (Covid-19), even though a certain new "normality" is now being experienced.

As this remarkable and unique experience was felt in different ways by people, some adapted to the technological change more easily than others, however, there is the issue of mental health that was neglected because some students (especially the less social) saw the remote classes as an opportunity not to leave home, using as an excuse the fact that they felt safer, i.e., not infected with the virus (Covid-19); others took it as a way to have more time for themselves.

## Questionnaire and analysis

In the following school year, and after the usual school vacation break, a short questionnaire was sought to understand the students' perceptions and how their experience of the face-to-face and online class system had been due to the pandemic. The questionnaire was sent to the undergraduate class that had been with the teacher/researcher for the entire school year, i.e., both semesters. The class consisted of twenty-five students of whom fifteen answered the requested questionnaire, eight male, six female, and one undefined. The questionnaire consisted of thirteen questions that will be described below (table 1):

Questions	Answers
1. Age:	(Free numerical answer)
2. Gender:	(Single choice answer) Female Male Undefined
3. Did you feel motivated to study and to develop the works requested in the curricular units?	(Single choice answer) Yes No Sometimes
4. During the remote classes did you feel motivated in the curricular units of Introduction to Design and Graphic Design?	(Single choice answer) Yes No Sometimes
5. As the curricular units of Introduction to Design and Graphic Design are essentially practical, what difficulties and facilities did you feel during the attendance of the 100% remote classes?	(Free response)
6. In the 100% remote classes, last year (the school year 2020/2021) which did you prefer?	(Single choice answer) Classes with the whole class in attendance Classes with reduced virtual classrooms
7. Last year (the school year 2020/2021) which class format did you most enjoy attending?	(Single-choice answer) 100% face-to-face 100% distance (remote)
8. What did you like the most about 100% face-to-face classes?	(Free response)
9. What did you like the most about the 100% remote classes?	(Free response)
10. How satisfied are you with the return to 100% face-to-face classes?	(Single choice answer) Very satisfied Satisfied More or less satisfied I am confused and cannot adapt Disliked
11. Why is it so important for you to attend face-to-face classes?	(Multiple choice answer) In the face-to-face classes I perform and grade better Facilitates my concentration and study organization It forces me to leave home and have a social life It is important for the development of exercises and projects with other classmates It facilitates the learning process It allows me to have access to resources, such as the library and shared work spaces such as labs, workshops and other spaces It is irrelevant to go to class in person, I can take classes remotely without a problem



12. In the present school year (2021/22) would you like to attend classes in what class format?	(Single-choice answer) 100% face-to-face 100% distance (remote) Hybrid format (face-to-face and remote)
13. How do you rate your level of preparation regarding the contents of the previous school year?	(Single-choice answer) Very difficult Difficulty Prepared Very prepared

Table 1: questions and their answers from the questionnaire.

To question number three: "Did you feel motivated to study and to develop the works requested in the curricular units?", eleven students answered yes, three answered sometimes and one answered no.

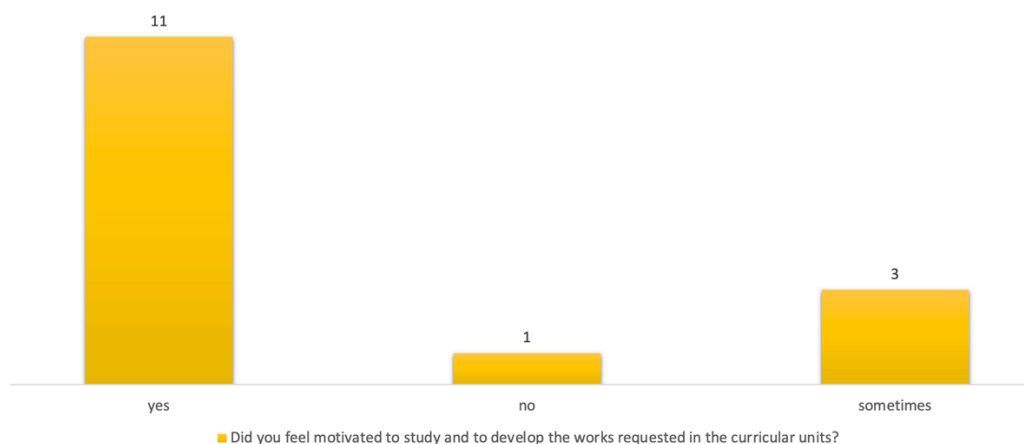


Figure 1: graphic with answer to the question number three.

To question number four: "During the remote classes did you feel motivated in the curricular units of Introduction to Design and Graphic Design?", ten students answered yes, four students answered sometimes and one said no.

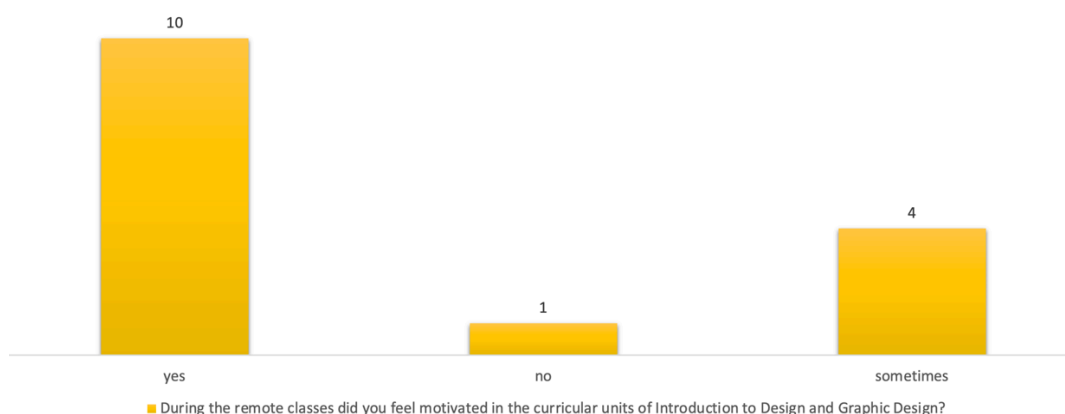


Figure 2: graphic with answer to the question number four.

To question number five: "As the curricular units of Introduction to Design and Graphic Design are essentially practical, what difficulties and facilities did you feel during the attendance of the 100% remote classes?". As this is an open-ended question, the students

answered that the difficulties they experienced were: lack of communication between classmates that could help in the exchange of ideas; lack of direct support and motivation; difficulties (interaction, in seeing the works come to life, printing the works, perception of the subject/works; in creativity and motivation to do some works); as a facility most of them consider the schedule, the organization of their schedule, gaining more time for other activities.

To question six: "In the 100% remote classes, last year (the school year 2020/2021) which did you prefer?", eight students answered that they preferred the classes with the whole class attending and seven preferred the classes with the reduced virtual classrooms.

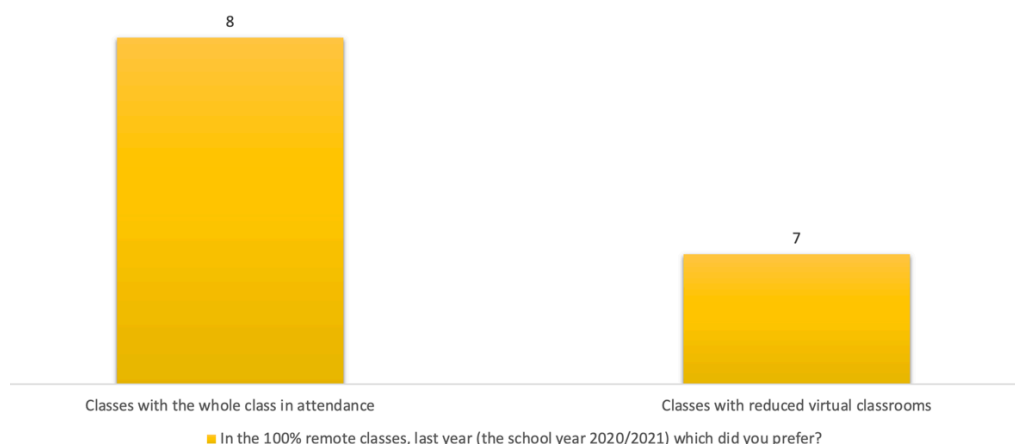


Figure 3: graphic with answer to the question number six.

To question number seven, "Last year (the school year 2020/2021) which class format did you most enjoy attending?" five students responded that they most enjoyed the 100% face-to-face classes while ten enjoyed the 100% remote classes.



Figure 4: graphic with answer to the question number seven.

To question number eight: "What did you like the most about 100% face-to-face classes?", the students answered that they liked to get to know their classmates and professors, the direct support, and the possibility to talk to people; to get answers from the professor faster; others answered that they did not like anything.

To question number nine: "What did you like the most about the 100% remote classes?", they said they liked the safety, being able to organize their time better; the reduction in commuting costs; being able to be more concentrated, and having more time to do their work.

To question ten: "How satisfied are you with the return to 100% face-to-face classes?", one answered very satisfied, seven answered satisfied, four answered I am confused and can't adapt, and three answered that they don't like it.

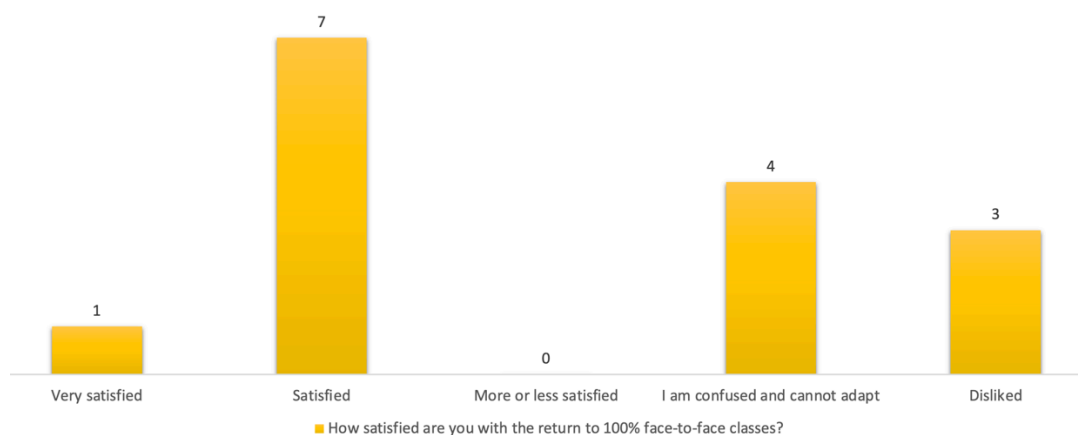


Figure 5: graphic with answer to the question number ten.

In response to question number eleven: "Why is it so important for you to attend face-to-face classes?", they answered that they force you to leave home, to have a social life; that it facilitates the learning process that it is important for the development of exercises and projects with other classmates, facilitates the learning process; allows access to resources, such as the library and shared workspaces such as laboratories, workshops, among others; in face-to-face classes, they consider that they perform better, that it facilitates concentration and study organization; on the other hand, one-third of the students think that it is irrelevant to have face-to-face classes, preferring remote classes.

To question number twelve: "In the present school year (2021/22) would you like to attend classes in what class format?", one student answered 100% face-to-face, three answered that they liked 100% remote (remote) and eleven answered they liked in a hybrid format (face-to-face and remote).

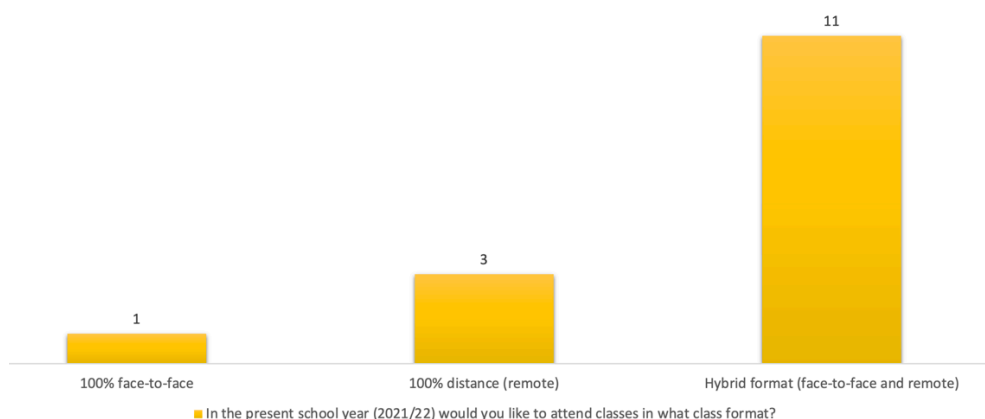


Figure 6: graphic with answer to the question number twelve.

Regarding the last question (13): "How do you rate your level of preparation regarding the contents of the previous school year?", three students answered that they had difficulty, five answered that they were prepared, and seven answered that they were very prepared.

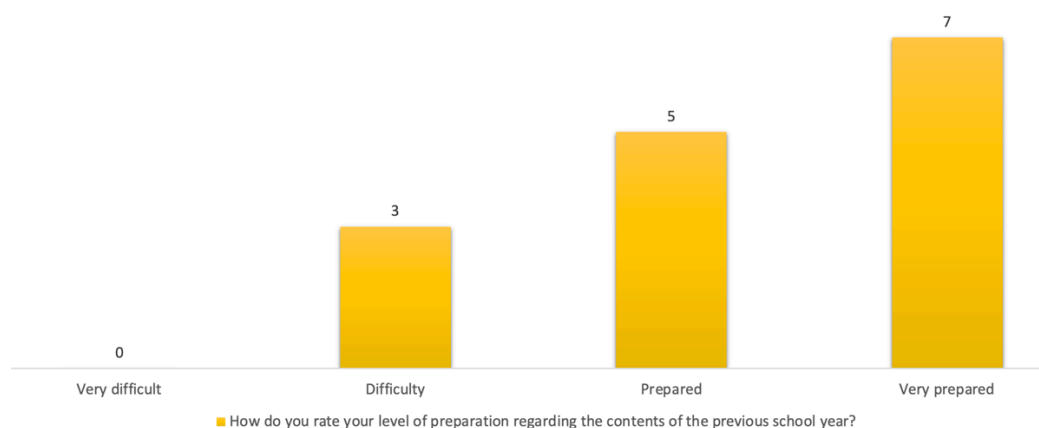


Figure 7: graphic with answer to the question number thirteen.

With this questionnaire, we can conclude that most students felt motivated both in the curricular units of Introduction to Design and Graphic Design. About the units of Introduction to Design and Graphic Design, the students felt difficulty in exchanging ideas with colleagues about the work done in class and also in seeing the final product (prototype). As an added value they consider that they were able to organize themselves more practically and effectively, and consequently, they were able to gain time for more activities, because, for example, they stopped "wasting" time on public transportation.

Regarding the preference for remote classes, most of the students said they preferred to have remote classes with the whole class rather than in small classrooms. The fact that the classes were for everyone had the added value of always sharing their questions and work together, because when they wanted to present the progress of the work to the teacher, the classmates also saw what they were doing and were invited to give their opinion.

Most students (two-thirds) liked attending the 100% remote classes better, because as mentioned they felt more secure and had more control of the time to do the assignments and other activities. About the 100% face-to-face classes, most of the students answered that they liked the fact that they could talk directly to the teacher and get a quicker answer/guidance about the work they were doing. Regarding the importance of face-to-face classes, most of the students answered that it forces them to leave home, that they have access to other resources/spaces that they don't have at home, and that it facilitates the development of the work/projects because they interact with other classmates and there is a more spontaneous exchange of ideas. Regarding the return to 100% face-to-face classes, more than half responded positively, i.e., they feel satisfied or very satisfied. The remaining seven students said they did not like or had difficulties adapting to the 100% face-to-face class format.

It is also interesting to note that most students would prefer to be attending the current school year with classes in a hybrid format, i.e., face-to-face and remote. This indicates that for the students, the most "balanced" class format would be a mixed class modality, in which they would gain from the positive points they listed, both from face-to-face and remote classes.

Although the academic year (2020/2021) was different, with uncertainties and rapid changes, the students consider that they were prepared, i.e., that the contents taught prepared them for the following years of the degree, as well as for the future.

## **Final Considerations**

We can conclude that there was a change in teaching and learning that for some time had been trying to be implemented little by little, however with covid-19 it had to be executed faster, even with flaws and without tests, that is, it was implemented and improved at the same time it was happening. It was and continues to be a learning experience for schools, teachers, and students. On one hand, there was the uncertainty of the virus and what came from it, it seemed that we were guided by something (virus) that was still strange to us, we lived day by day with the uncertainty of whether the next day the classes would be presential or remote because when the virus appeared little was known and in Portugal if a student had been infected and/or had had a risk contact with the class, all the students would have to stay in isolation, and the teacher would be forced to give the class remotely. These situations often happened on the spot, i.e., if the teacher had a lesson prepared to be more practical, he or she would have to conduct it remotely, which could make it difficult for the students to grasp the knowledge.

These students lived a unique experience, whether it is considered good or bad, it will be something that will shape them for the rest of their lives, and this reason, it is important to consider this experience, to take something away, to understand what was learned, and not to stop in time, that is, not to go back. As seen through the short questionnaire proposed, the students liked having remote classes, because it was an experience that they lived and that now seems to be difficult to take back in its entirety. The theoretical-practical units, as the name indicates have to have a good practical part that is essential to be done face-to-face, the immediate interaction with colleagues is important and for some, essential.

It is important to be able to transmit to the student the way he should proceed in the case of design, that is, the process he should follow, the way he should "think" and this is something that in the remote mode can be difficult to demonstrate and to see if the student is doing it the right way. In remote, design classes you can't see the student executing, while in face-to-face classes you can have another notion of the path the student is developing and if he is doing it consistently and coherently. Last school year (2020/2021), there was content that needed to be developed differently with constant interaction, and because everyone was at their computers, that didn't happen. Students ended up having more time to develop their work because the class was not all synchronous, having an asynchronous part, but on the other hand, there was not the possibility of experiencing some realities that students who are currently finishing the 1st year experienced.

In the face-to-face classes last school year (2020/2021) we tried to compensate for the gaps that may have existed in the remote format classes, i.e., we wanted them to develop the work with the teacher's direct monitoring and to make prototypes of the works requested, something that enriched the works and consequently, They were enthusiastic, although at first, they felt a certain reluctance to elaborate the physical and printed prototypes, because besides being a generation more turned to technology and digital they were accommodated, and it was necessary to encourage them, reminding them that with the print they would have a better perception of the final (real) result.

As with everything in life, there are pros and cons, however, the most important thing is to know how to take advantage of opportunities to evolve, so it is considered that students had the opportunities possible within the pandemic period.

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## ***The Effects of Mindfulness on Adolescents With Special Needs' Readiness for Learning***

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### **Abstract**

Special needs educators, anecdotally, feedback that students demonstrated adverse learning behaviours and attitudes towards academic learning by adolescent age, compared to their peers, when they face severe learning challenges. With preliminary evidences supporting mindfulness-based programmes' positive effects on academic functioning, this pilot study aims to investigate the effects of providing adolescent students with mindfulness tools and its impact on their learning in a school setting. The study employs a single group pre-post no-control design. The students were screened with behavioural rubrics that examine attention, self-control, participation, and respect for others, as well as their phonological skills. Four students were shortlisted to attend a 12-session mindfulness held twice weekly for an hour. They practiced mindfulness activities for the first half of each session followed by activities on phonological awareness. Six applications of mindfulness: body, senses, breath, attention, thoughts, and emotions were covered. The students demonstrated improved attentional regulation, self-control, participation, and respect for peers and facilitators. Their abilities to perform phonological awareness activities also advanced. Post student attitudinal questionnaires reflected their focus in sessions, preferences, and likelihood to continue using mindfulness tools after the programme. This presentation will address whether mindfulness intervention is associated with improvements in various indices of student behaviour and learning via facilitators' report and students' self-evaluation. Implications of this study may contribute to the future use of mindfulness in class setting to promote learning. Inclusion of control group and larger sample size are needed for future studies.

Keywords: Mild Intellectual Disability, Mindfulness, Readiness to Learn

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## Introduction

APSN Tanglin School is a Special Education (SPED) school for students with mild intellectual disability between the ages 13 to 16 years old. Its curriculum aims to engage students with the required knowledge, skills and attitudes for living, learning and working in the 21st century. Specifically, it prepares students with pre vocational skills necessary for their transition to post-school options, for example learning a vocational curriculum leading to national certification in selected industry areas (i.e., food and beverage, retail operations, horticulture, hotel and accommodation services), customised training pathways or work options.

Typically, to achieve quality of life, among other skills, reading and spelling is a core skill that will enable one to learn and obtain necessary qualification on a skill for equitable remuneration as well as to function adequately in our daily activities of living, since we live in a text-based society. However, in the process of teaching and remediating reading and spelling skills, anecdotally, SPED educators and Speech Pathologists feedback that this profile of students lacked the readiness to learn in addition to their learning disabilities. Generally, these students demonstrated adverse learning behaviours and attitudes towards academic and pre vocational learning by adolescent age, compared to their peers.

Having diminished abilities to cope with academic-related stress can negatively impact their academic functioning, educational performances, and their overall self-concept in academic domains. Considering the significant challenge of SPED educators providing both academic and social behavioral support to these students in the classroom, a collaboration between the allied professionals trialled a small group mindfulness and phonological intervention for this profile of students.

Currently, there are numerous studies suggesting that mindfulness practices in school enhanced students' attention and self-regulation as well as having positive association with school readiness, social skills and academic performances (Beauchemin, J., Hutchins, T.L., & Patterson, F., 2014; Harpin, S., Kim, R.A., Swanson, L.M., 2016.). It is also suggested that mindfulness training creates a positive learning environment for students to learn and prime their focus in learning, in the process they also became more calm, responsive and participative in learning (Magaldi, D., Park-Taylor, J. (2016).

Defined as a mental state, mindfulness refers to an ability to pay attention that arises from moment to moment, in a nonjudgmental way (Kabat-Zinn, 1994, p.4). In teaching and applying mindfulness activities (MA) such as the use of breathing, senses, attention, movement, thoughts and emotions, the hypothesis is that SPED students could apply these strategies in dealing with academic challenges.

## *Aims*

This study explored the effect of the "I am Ready" (IAR) programme, i.e., a group intervention programme which uses MA to improve the readiness to learn skills and acquire phonological skills for adolescents with Mild Intellectual Disability (with or without commodity of autism spectrum disorder, ASD).

It hypothesizes that when MA are taught and practiced, SPED adolescents are able to:

- Understand and use mindfulness tools.
- Pay attention to participate in tasks.
- Gain composure to participate in tasks.
- Physically regulate and engage in activities.
- Show care and respect for others.

In addition, it is also hypothesized that equipped with mindfulness skills, SPED adolescents are able to improve their readiness to learn skills which is evident by being able to acquire the following phonological skills that will improve their ability to decode (read) and encode (spell):

- Identify letter-sound of the 26 letters in the English alphabet.
- Identify, segment and blend syllables in words.
- Identify initial, final and middle sounds in words.
- Blend, segment, and manipulate sounds in words.

## **Methods**

This study used a pre-post no-control design, with three months follow-up.

### ***Participants***

Participants were required to have a diagnosis of mild intellectual disability with little or no awareness of phonological skills (PA), and were in their first year of study at APSN Tanglin School. While five participants met the inclusion criteria of the study, after being screened by the literacy teachers and the speech pathologist, one of the participants was excluded from this study due to absenteeism. Hence, four participants took part in the study and they were aged between 12 to 13 years old with or without commodity of autism spectrum disorder.

### ***Interventions***

The participants had an hour of IAR programme twice weekly for a total of 12 sessions. Each session is approximately 60 minutes. The MA, led by the psychologist, was conducted for the first half of the session. The MA was explicitly taught, modeled and the participants were provided opportunities to practice MA. A total of six elements of MA were covered in the programme: (1) introduction to mindfulness, (2) mindful breath, (3) mindful body and senses, (4) mindful thoughts, (5) mindful attention, and (6) mindful emotion. Details of the sessions are shown in **Table 1**. The materials used consist of visual illustrations, videos and customized scenarios to support the participants' understanding. In addition, they were encouraged to decide their preferred MA and to practice it during the sessions.

Table 1: MA session details

Sessions	Mindfulness activities (MA)
Session One and Two <i>Theme: introduction on mindfulness</i>	Introduction to mindfulness Mindful body – grounding (five senses) Mindful looking – bubble bounce Mindful breathing – square breathing
Session Three and Four <i>Theme: mindful breath</i>	Recap Mindful breathing – sunshine breathing, mountain pose, moon pose
Session Five and Six <i>Theme: mindful body and senses</i>	Recap Grounding (five senses) Mindful listening Mindful taste test
Session Seven and Eight <i>Theme: mindful thoughts</i>	Recap Mindful thoughts – WAIT Mindful breathing – rainbow breathing Mindfulness activities – choice of participants
Session Nine and Ten <i>Theme: mindful attention</i>	Recap Mindful breathing – choice of participants Mindful attention – find the quiet Mindfulness activities – choice of participants
Session Eleven and Twelve <i>Theme: mindful emotion</i>	Recap/Wrap up Mindful breathing – choice of participants Mindful emotion – be the pond Mindfulness activities – choice of participants

The PA activities, led by the speech pathologist, were conducted in the second half of the sessions. It used the explicit instruction structured approach i.e., systematic synthetic phonics (SSP) to introduce PA to participants. They learn the relationships between the sounds (phonemes) of spoken language and the letter symbols (graphemes) of the written language. Participants sound, blend (e.g., “What word do these sounds make when we put them together?”), segment (e.g., “Let’s sound out this word”), and manipulate (e.g., “Which letter should we change to make this word?”) letter-sounds after learning a few letter-sounds (e.g., letter-sounds of ‘s’, ‘a’, ‘t’, ‘p’, ‘i’ and ‘n’). They build up their phonic skills from their smallest unit (graphemes) and alphabet knowledge while they continue to practice the skills of blending, segmenting, and manipulating as they learn more letter sounds. PA activities included “games”, visual materials, and gestural movements to increase participants’ engagement, and orthographic mapping.

### ***Outcome measures***

*The Student Behavior Rubric by Kinder Associates, LLC (2007).* The facilitators (psychologist and speech pathologist) rated the participants’ behaviors in the programme using four behavioral metrics: (1) paying attention, (2) self-control and self-calming, (3) physically self-regulating and engaging in activities and (4) show respect and care for others. Each item was ranked using the Likert scale from zero to four (i.e., 0 = *no attempt*, 1 = *needs continual support*, 2 = *some of the times*, 3 = *most of the times*, 4 = *all of the times*). The Krippendorff’s Alpha was 0.77, an indicative of a tentative statistical conclusion for inter-rater agreement.

*Post Attitudinal Survey.* The participants completed post intervention survey, ranging from the least agreed (zero point) to the most agreed (10 points) (e.g., the frowning face = *the least agreed*, the smiling face = *the most agreed*), to evaluate their own focus, composure, participation, level of care and respect for others, rate their liking of the programme and the likelihood of continuing to use MA on their own. In addition, the participants were asked to rank their preferences towards MA by using the Likert-scale (e.g., 1 = *the least preferred*, 5 = *the most preferred*) and list at least three MA that they will continue to use on their own.

*Phonological Awareness Survey.* The speech pathologist screened the participants' alphabet knowledge and phonological skills before and after the programme using Really Great Reading's complimentary phonological/ phonemic awareness survey. It is a one-on-one assessment of phonological awareness skills, including blending word parts, and phonemic awareness skills, including matching, identifying, blending, and segmenting phonemes in words. Students were also screened for their ability to write the 26 letters in the English alphabet, their letter sequence and letter-sounds.

## Results

The intervention effect on the participants' behavioral performance based on facilitators' reports indicated that the participants showed overall improvement on their attentional control, demonstrated better self-control and self-calm, increased participation in activities, and displayed better care and respect for others. The result was shown in Figure 1. These improvements were also maintained after the intervention period, after three months follow-up. There was however no statistical significance between the baseline, intervention and maintenance phase.

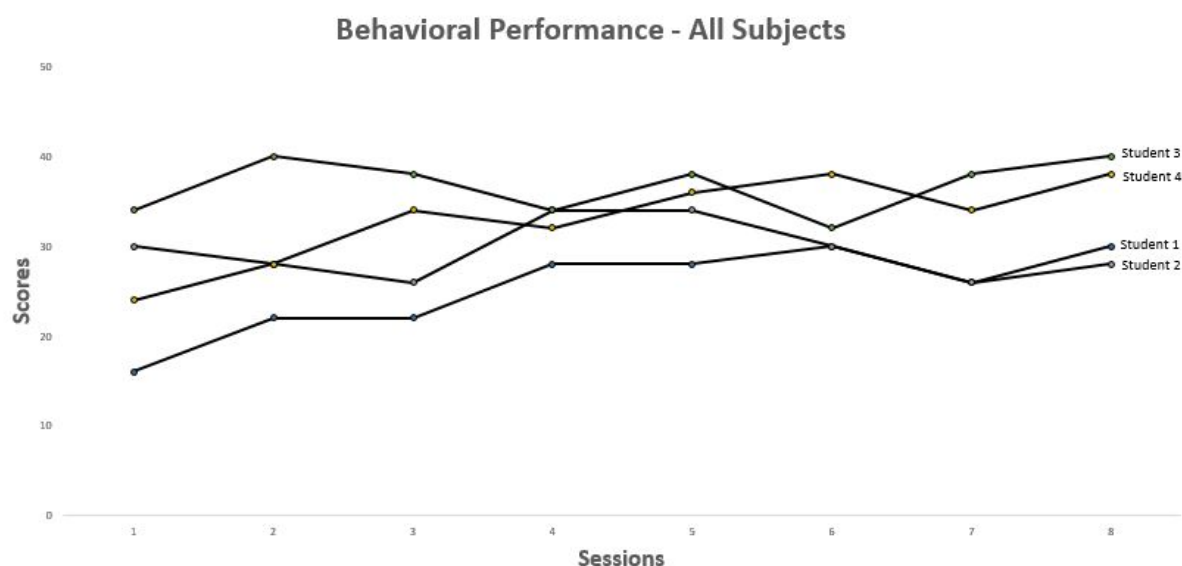


Figure 1: The change of behavioral performance for all subjects

The post attitudinal survey asked the participants to offer a brief verbal response to their understanding of mindfulness. Responses from the participants indicated that mindfulness led to feelings of calm, relaxation, focus and overall positive feelings. Participants' self-report on their attitudes and performance on their own focus, composure, participation and level of care and respect for others indicated that they had an overall positive evaluation i.e., the mean response was 8.6. The participants also gave their statement that rated their liking of the

programme and the likelihood of continuing to use MA on their own, resulting in a mean score of 9.5 that were shown in Figure 2. The survey also offered participants the chance to rank their preferences on deep breathing techniques taught in the programme, indicated the ranking as such i.e., from most preferred to least preferred: (1) rainbow breathing, (2) sunshine breathing, (3) mountain pose, (4) moon pose and (5) square breathing that were shown in Figure 3. Similarly, the participants ranked their preferences on other MA and the ranking was (1) mindful listening, (2) mindful looking, (3) mindful taste test, (4) be the pond, (5) find the quiet voice, (6) WAIT technique and (7) grounding that were shown in Figure 4.

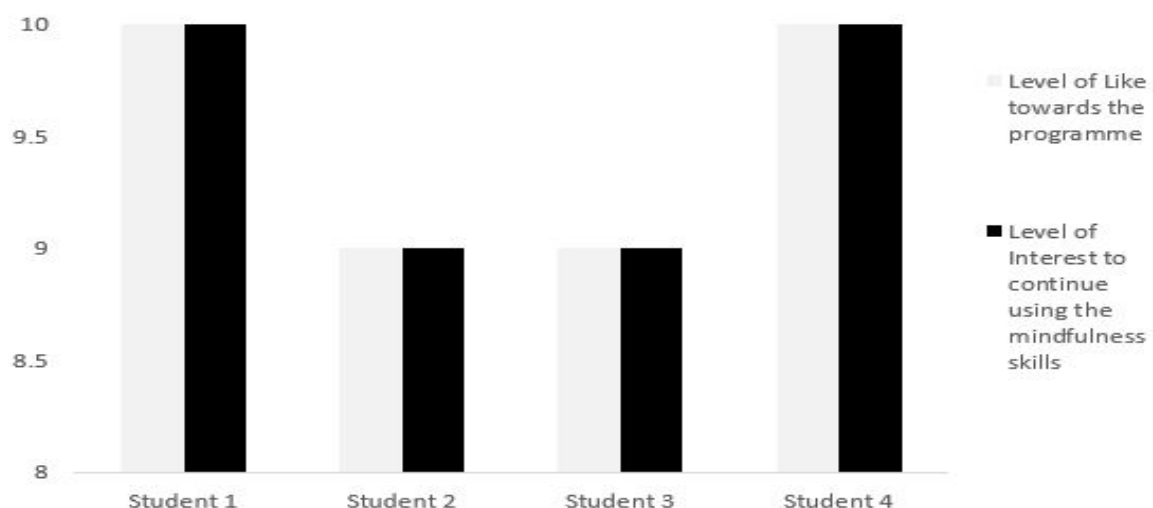


Figure 2: Level of like and interest toward mindfulness activities

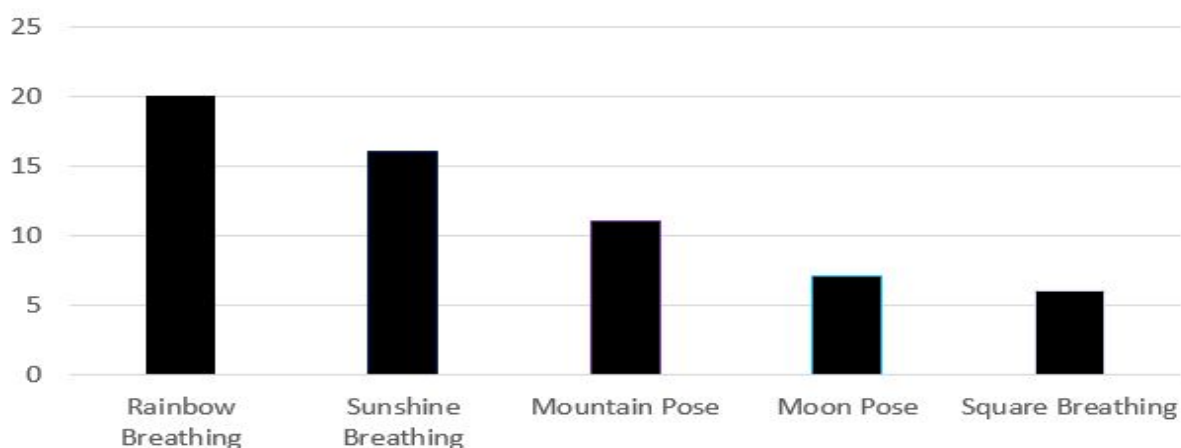


Figure 3: Students 'preferences on deep breathing techniques

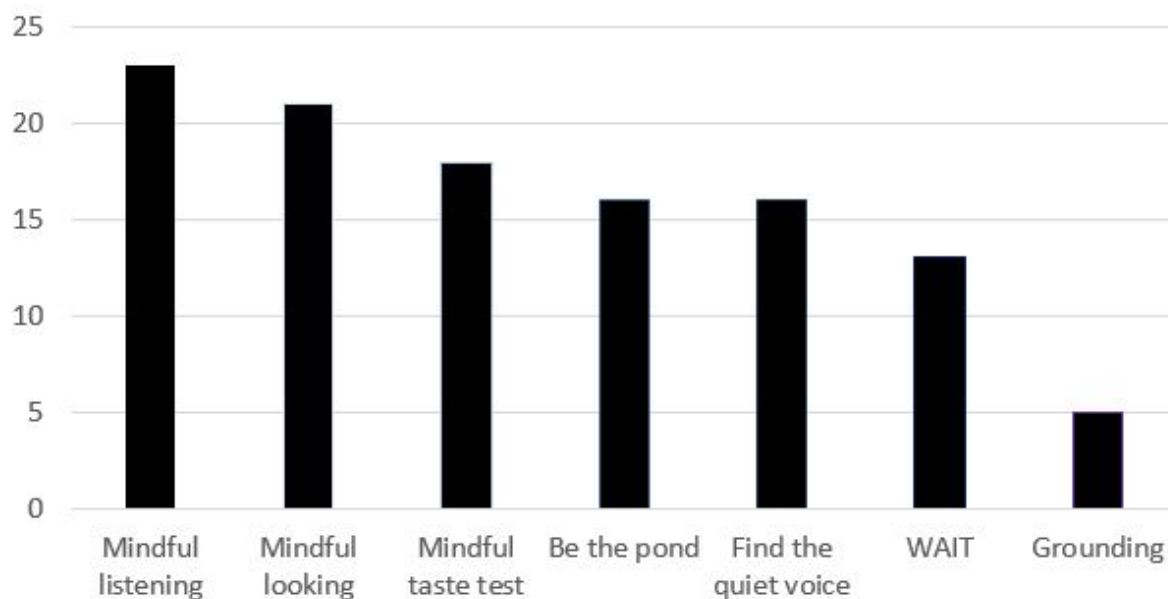


Figure 4: Students 'preferences on other mindfulness activities

The results of this study supported our hypothesis with all participants gaining improvement in all components of their phonological skills and alphabet knowledge. Specifically, their alphabet sequencing increased by more than 20%, letter sound awareness by at least 17%, phonological awareness by at least 7%, and phonemic awareness by at least 13% (see Figure 5). The effects of intervention on each of these skills were shown in Figure 5.1 to 5.4. At the maintenance phrase, they were able to maintain the use of their new skills learnt, and build on those skills to acquire additional, though modest, phonological skills.

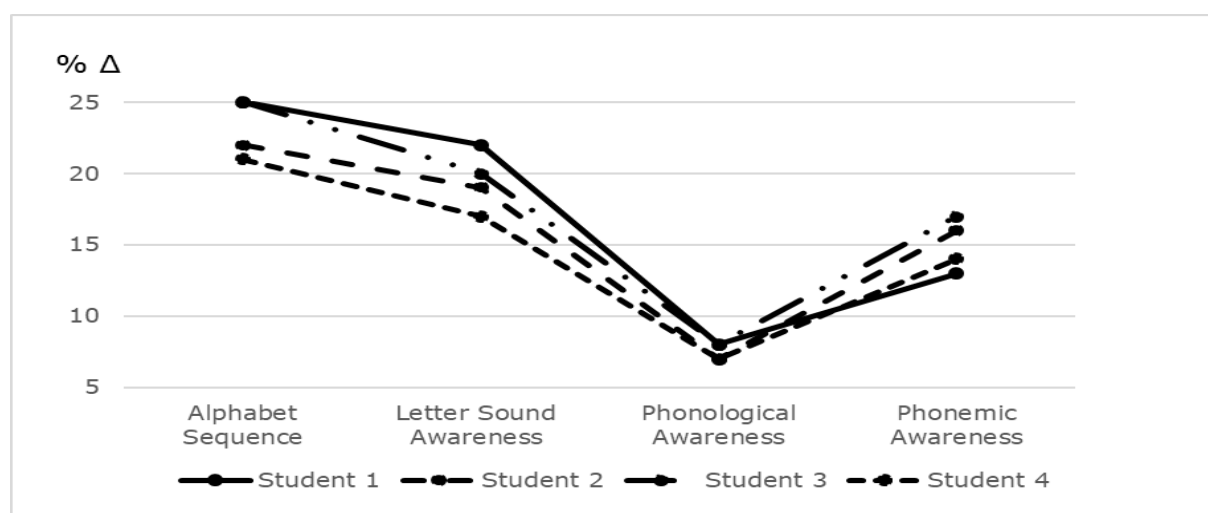


Figure 5: Percentage change of phonological skills after the programme

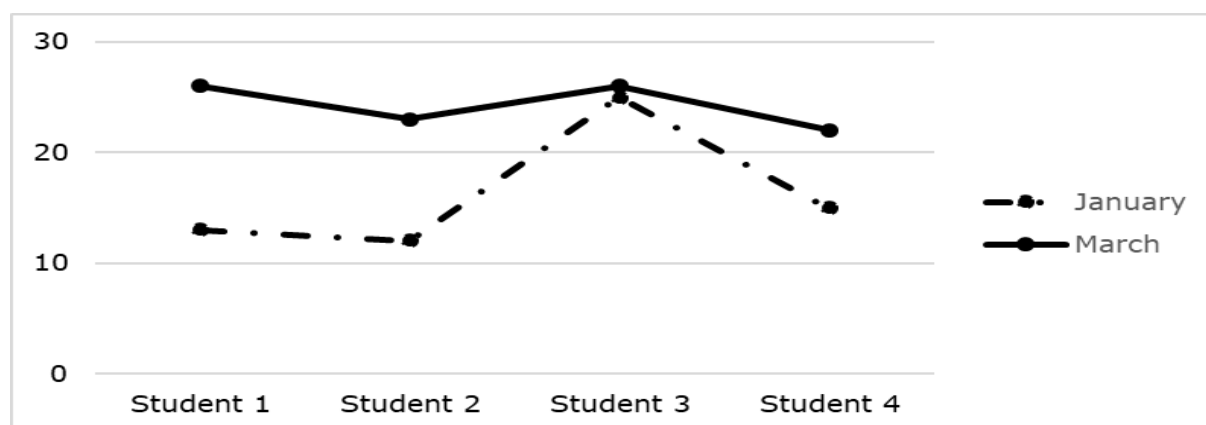


Figure 5.1: Programme effect on students' alphabet sequence skills

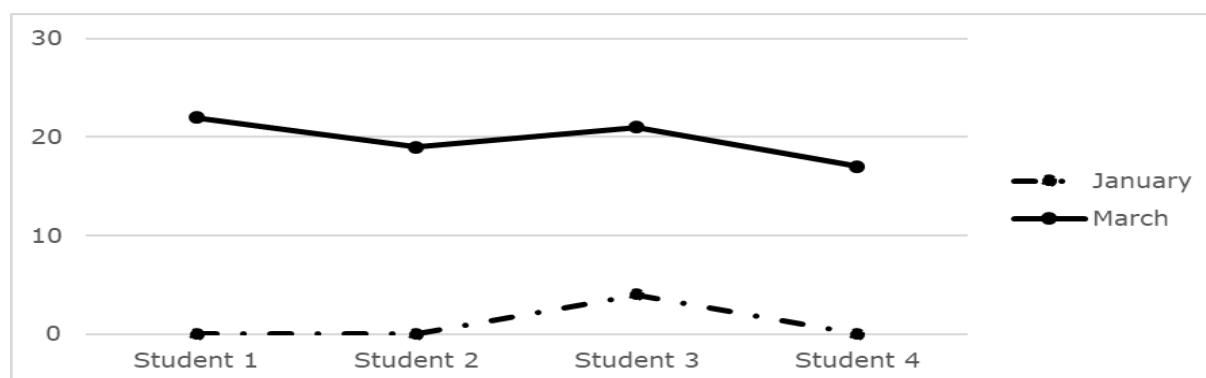


Figure 5.2: Programme effect on students' letter-sound skills

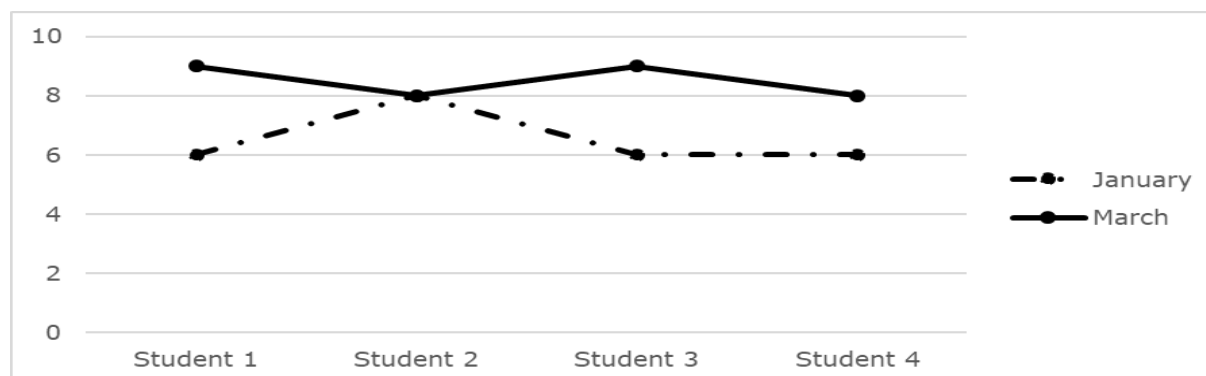


Figure 5.3: Programme effect on students' phonological awareness skills

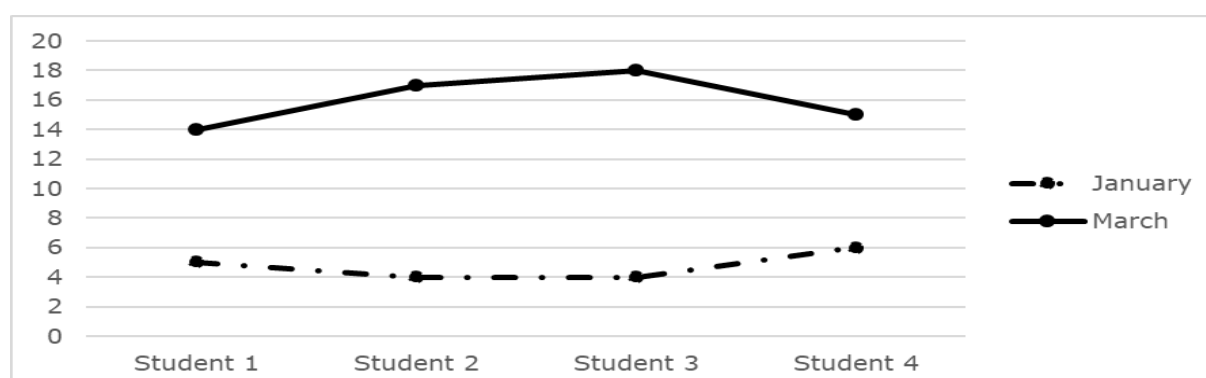


Figure 5.4: Programme effect on students' phonemic awareness skills



## Discussion

These preliminary findings suggested that the incorporation of mindfulness activities can yield positive findings, specifically, positive behavioral change and readiness to learn in participants. All participants also reported positive evaluation and willingness to participate in mindfulness activities after the programme.

A possible reason for not obtaining a statistical significance result on the participants' behavioral performances may be the length of the intervention. Data collected over the course of several months to years will be more substantial to evaluate the claims of the benefits of mindfulness practice and its effect to improve their school readiness skills. This might be particularly essential as the participants have no prior experience with mindfulness activities, and participants' diagnosis of MID might require more intensive or frequent MA practices before its effect could achieve statistical significance.

The participants had not been able to acquire elementary phonological skills or fluent alphabet knowledge for the past six years of their academic learning prior to this programme. Practically, while they require more practice to improve their fluency and consistency in using their newly learnt skills, they demonstrated improved PA skills and were able to sound out simple two-letter and three-letter words.

In addition, after the programme, while they still felt challenged whenever they practiced their PA as they furthered their learning to read and spell, they were able to retain their readiness to learn skills and could persevere with their PA practices.

With a common language to prompt participants to leverage on their newly acquired mindfulness skills, the participants required less support to be guided and spent less time to ground and redirect themselves to focus their attention on their task on hand, i.e., PA activities. Such an encouraging difference in learning experience for both the facilitator and the participants could have positively contributed to the participants' ability to acquire improved phonological skills, albeit rather slowly.

## Conclusions and Clinical Implications

This small study demonstrated that mindfulness training can lead to increases in social and behavioral competence that promote greater readiness skills in learning phonological awareness activities as evidenced by the improvement in participants' scores, even for adolescents with MID (with or without comorbidity of ASD).

Whether the mindfulness training component plays a direct or indirect role in fostering the readiness to learn skills, the inclusion of mindfulness activities might represent a value-added component to regular intervention programmes, as it could promote greater social and behavioral competence, as well as better well-being for both participants and their educators. The reinforcement and continuity of the use of MA by participants would be easier to sustain when the participants and their educators embraced the importance of mindfulness and were equipped with the skills to practice them.

## **Acknowledgements**

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***Declaration of interest:*** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

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***Using Peer-Assisted Problem-Based Learning to Develop Business Systems  
Analysis Skills: An Experience Report***

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**Abstract**

This paper reports on the experiences of using peer-assisted problem-based learning (PAPBL) in a very large class of postgraduate students for an assignment spanning two complementary modules (Database Technologies and Systems Analysis). Students worked in teams of three. They were provided with a realistic business case study and required to generate data flow diagrams, UML diagrams, a fully normalised entity-relationship model, and SQL code to build the database. All teams were required to provide peer feedback on the draft solutions of two other teams, and in their final submission to explain how (or why not) they modified their work in response to peer suggestions. Each individual student was also required to write a reflection piece about their experience of working in a team and of receiving peer feedback. Additionally, they were asked to complete a survey seeking opinions on how PAPBL helped them to develop study skills, build confidence, make learning more enjoyable, clarify understanding of fundamental and complex concepts, consider and value the perspectives of others, and gain practical skills. Student feedback on the effectiveness of the lecturers in guiding the process was also sought. Quantitative and qualitative findings based on analysis of students' experiences are presented, further backed up by the lecturers' reflections on what worked well and what did not.

**Keywords:** Peer-Assisted Learning, Problem-Based Learning, Active Learning, Database Systems, Business Systems Analysis, Information Systems Education, Computer Science Education

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## Introduction

The School of Business & Economics at the University of Galway is globally accredited by AACSB (the Association to Advance Collegiate Schools of Business), prestigiously placing it amongst 5% of business schools similarly recognised across the world. As a result, national and international demand for places on the school's postgraduate programmes in business information systems (BIS) has dramatically increased in recent years. From 2017/'18 to 2021/'22, the number of postgraduate students registered on the school's various BIS programmes rose by 113%. At the level of individual modules, this increase has been most sharply felt by those that are offered across multiple programmes. This paper reports on experiences from two such modules – Database Technologies and Systems Analysis – which saw the number of students increase by 40% and 44% respectively in the past three years.

In 2021/'22, the number of students enrolled on these two modules exceeded 200. This presented the lecturers with an interesting pedagogical challenge: how to create a means of assessment that encouraged students to meaningfully engage with the material (while ensuring adherence to the rules of academic integrity), and also incorporating a mechanism that provided students with timely formative feedback on their work (given the lecturers' constrained ability to handle the volume of queries within a very large class). It was therefore decided to introduce an inter-module project spanning the two modules, using an innovative approach that combined principles of peer-assisted learning (PAL) and problem-based learning (PBL), hereafter referred to as peer-assisted problem-based learning (PAPBL). This paper reports on the students' and lecturers' experiences of using this approach.

## Related Work

Problem-based Learning (PBL) is an active learning approach based on the theory of constructivism, underpinned by four tenets: learners construct their own meaning to build knowledge, new learning is founded upon prior knowledge, the process is enhanced by collaborative group-based activities, and the problems to be addressed should be based on realistic scenarios (Cooperstein & Kocevar-Weidinger, 2004).

PBL has been found to be an effective approach for helping students to learn essential skills in business systems analysis and database systems design (Luce, 2000; Richardson & Delaney, 2009; Fatima & Abdullah, 2013; Qotimah & Muslim, 2019). In PBL, the challenges being explored are typically ill-defined with no definitively correct answer. PBL therefore encourages critical thinking and creative problem-solving. PBL is also helpful in developing interpersonal, teamwork, planning and time management skills (Woodward et al., 2010; Hwang, 2018).

PBL may be used in conjunction with peer-assisted learning (PAL), which is defined as: "the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions. It involves people from similar social groupings who are not professional teachers helping each other to learn and learning themselves by so doing" (Salkind, 2008).

PAL has been successfully used in medical education for quite some time and is now a well established approach in that field of study (Glynn et al., 2006; Wadoodi & Crosby, 2002). The reciprocity of educational exchange is one of the key benefits of PAL, as participants scrutinize and influence each others reasoning processes while working towards a shared

goal. In their exploratory study, Wynekoop & Kazuo (2020) found that the use of PAL in a systems analysis class can help students develop critical thinking skills.

As alluded to by Richardson & Delaney (2009), the successful implementation of PBL requires considerable resources. Unfortunately, as class sizes increase in response to universities prerogative to meet funding shortfalls, even the most arduous teachers are struggling to find enough hours in the day to communicate with students. The approach described in this paper aims to remediate this problem by leveraging the potential of PAL to help the students help themselves; that is, peer-assisted problem-based learning (PAPBL).

Although PBL and PAL are very well established approaches within ICT education – especially in areas such as programming, systems analysis, software engineering and database development (Brodie et al., 2008; Alva et al., 2018; Brilingaite et al., 2018) – there are surprisingly few surveys of student experiences in the mainstream academic literature. This paper makes a contribution in this regard by presenting an analysis of quantitative and qualitative data gathered from students, building on prior student surveys conducted by Luce (2000), Sindre et al. (2003), Lavy & Yadin (2010), El-Khalili (2013), Tadjer et al. (2020) and Mitchell et al. (2021).

### **Study Context and Research Method**

This study is based on two complementary modules taken by postgraduate students within the author's institution. One module ('Systems Analysis') introduced students to aspects of requirements analysis, business process modelling (DFDs, UML), and agile methods. The other module ('Database Technologies') covered data modelling, relational database design and SQL. Initially there were 235 students, 199 of whom were enrolled on Systems Analysis and 223 on Database Technologies. For various reasons, 19 students (8%) withdrew along the way, leaving 216.

The two modules ran in parallel during the first semester of the the 2021/'22 academic year, with lectures and on-line self-directed tutorials taking place across a twelve week period. The normal delivery of both modules was affected by restrictions necessitated by the ongoing COVID-19 pandemic, and was further upset by a major cyberattack on the university's systems four weeks into semester that crippled on-campus network connectivity and effectively forced students and teachers to work from home. Because of this, the lectures were recorded and made available on-line to facilitate asynchronous engagement.

The class was made up of 40% females and 60% males, ranging in age from 19 to 51 with median of 24 years. Their nationalities were India (71%), Ireland (17%), China (5%), and twelve other countries spanning five continents (7%). Students came from various disciplinary backgrounds and, because of high levels of demand for places on the programmes, they had strong academic credentials. This diversity of life experience, prior learning and problem-solving perspectives meant that there was a pool of knowledge and talent within the class that could be tapped into for the purposes of peer-assisted learning.

### **Assessment Design and Administration**

The class was broken into 79 groups, randomly selected by the lecturer. No changes to groups were permitted. Most groups comprised three members but a few just had two. 12

groups were enrolled on the Database Technologies module only, 4 on the Systems Analysis module only, and the remaining 63 studied both modules.

The ‘Teton Whitewater Kayak’ Company teaching case developed by Parker (2003) was selected as the basis of the inter-module assignment. This case is well suited to teaching database design and/or business process modelling. It is sufficiently challenging and detailed, yet leaves enough to students’ imagination that they must be creative and evaluate the merits of various potential solutions.

The assignment specification for the Systems Analysis component required groups to produce a functional decomposition diagram (FDD), a context-level and systems-level data flow diagram (DFD), a DFD for any of the first-level processes, a UML use case diagram for any of the main processes, and a UML activity diagram, sequence diagram or state machine diagram for any of process.

The assignment requirements for the Database Technologies component were to produce a logical entity-relationship model (ERM) using any common diagramming notation (i.e. Crow’s foot, UML, etc.), a fully normalized relational database schema with explanations of design rationale, and the SQL data definition statements to build the tables and relationships.

A tailored collection of LinkedIn Learning tutorials was made available to students and they were also provided with other hand-picked learning resources specific to the assignment. In addition to a number of lectures covering the relevant material, a dedicated workshop session was scheduled to walk in detail through the requirements of the assignment with students.

In both modules, students posed several questions via emails to lecturers about the assignment; for example, “*can you please explain the difference between <includes> and <extends> on a UML use case diagram?*”, “*where can we see some further examples of a Functional Decomposition Diagram?*”, “*is it allowable to make minor changes to the case study if we make assumptions about some things that are not explicitly stated?*”, “*regarding the last sentence of Section X.X of the case study, are we correct in interpreting that as meaning ... ?*”. Answers were posted on the Blackboard VLE system for the equal benefit of the entire class.

The looseness of the specification was intentional, so as to create greater scope for variety and less opportunity to copy the work of others. Students were advised that there was no single best solution and that each group’s assignment was expected to have its own unique character, with extra marks going for very well presented solutions that demonstrated innovative capabilities. Assignments were submitted via the Turnitin originality checking portal, so as to compare each group’s solution against those of others.

Prior experience with students on this programme was that they tended to help each other on assignments, at times crossing the line between legitimate assistance and illegitimate collusion. Because of this, it was decided to introduce peer-assisted learning into the assignment with clear guidelines as to what was allowable. Every group was required to provide peer feedback on the draft solutions of two other groups (specified by the lecturer), and in turn each group received feedback on their preliminary efforts from two other groups (not the same ones). Thus, each group interacted with four other groups. Each group was told to appoint a leader to take responsibility for the submission to Turnitin and communicating



with peer groups. In assigning peer groups, the 16 groups taking just one module were paired with groups taking that same module.

Students were told that peer review feedback should be brief (less than 1 page to each group). They were advised not to directly comment or agree on the correctness/incorrectness of the drafts that they reviewed, but rather to give ‘pointers’ instead of answers. Indicative examples of allowable comments were provided, such as: *“Are you sure that you have chosen a primary key for Table X that is unique and not null?”*, *“Consider again the cardinality of the relationship that you indicate between Table X and Table Y?”*, *“Is Table Z really necessary in your model?”*, *“It seems that you have a ‘grey hole’ on your second level DFD”*, *“Your UML activity diagram appears to be missing important aspects relating to XXX”*, etc.

A date, one week in advance of the final deadline, was set, at which point in time groups circulated draft solutions to each other for peer feedback. Communication with each other prior to that date was not permitted. The groups were allowed three days to review the two draft solutions that they received and provide feedback; they then had up to another four days to consider the feedback they received and to finalise their own solutions. Each finalised solution was required to contain, in addition to the aforementioned requirements, a copy of the feedback points received from peer groups and an explanation of any changes made in response to that feedback. Separately, each group member was required to submit their personal reflections on positive and/or negative experiences of peer-assisted learning on this assignment. In addition, each group member had to fill out a confidential ‘Individual Contribution and Peer Evaluation Form’, in which they outlined their own input to the group’s submission, and commented on the equity of work done by each group member (if two or more members of a group indicated that some of their peers did not contribute fairly, follow-up action was taken to investigate the reasons why).

Students were also requested to complete an opinion survey about their experiences of PAPBL, which was closely based on items drawn from instruments used in previous studies (Luce, 2000; Hammond et al., 2010).

## Results and Discussion

Students’ experiences of using PAPBL to develop business analysis and database design skills were tremendously positive and enthusiastic. Interestingly though, a Kruskal-Wallis test revealed a statistically significant difference across age groups in the strength of agreement with the statement that ‘Overall, peer-assisted problem-based learning was a useful experience for me’,  $\chi^2$  (df=4, n=212) = 9.707,  $p < .05$ . Although all age groups overwhelming agreed with this statement, those who strongly did so differed noticeably by age group (19-21: 35%, 22-25: 42%, 26-30: 51%, 31-40: 75%, 41+: 86%). This may be because the class included some mature adult learners, who seemed to engage more with the process than the younger cohort.

### *Development of Skills*

88% of students agreed that PAPBL helped them to develop their study skills and prepare better. A similar percentage agreed that the exercise enabled them to improve their self-confidence. 88% of respondents indicated that the assignment helped them to clarify their understanding of fundamental concepts, and 83% found that it helped them improve their

grasp of more complex concepts. Notably, 93% of students responded that group work helped them to develop and practice interpersonal communication skills.

### ***Experiences of PAPBL within Groups***

As regards learning preferences, it was notable that just 19% of students felt that they learn better by themselves than in a group. 31% of students were undecided on this, but a clear 50% were in agreement that working in groups enabled them to learn more easily.

81% of students agreed – 48% of them strongly – that PAPBL made the assignment more enjoyable than if they had been working alone. 77% indicated that the quality of their work improved as a result of working in a group for this assignment, and 89% responded that working with a team motivated them to keep their own progress on track. An even higher percentage, 95%, were in agreement that PAPBL helped them to consider and value other students' perspectives.

Several students commented that they would have preferred to nominate their own teammates rather than being randomly assigned. However, the rationale for random assignment was clearly explained in class: it was a deliberate effort to simulate the reality of a professional workplace, where individuals do not choose their colleagues but instead must learn to work productively and respectfully with others. It was put to students that perhaps they might find themselves working with a person who doesn't value their opinion, or they may feel that a member of their group is not sufficiently contributing, but they will almost certainly encounter such situations in their future careers and must learn how to deal with them. Moreover, when seeking academic references for graduates, employers typically ask about inter-personal and teamwork skills as matters of high priority. As one of the students noted in the personal reflection: *"It would have been better if we were asked to choose partners ourselves but, considering a real life situation, we often don't have a choice of working in the group of our choice so we have to make the best of things."* (Student 214).

The author's own experience is that if students are allowed to self-select partners, weaker performers and those in minority categories tend to be marginalised. That runs contrary to the principles of PAPBL, where every student has an equal opportunity and is equally valued.

Indeed, one student commented on the inclusive nature of the project: *"This is the only group project so far that reminded me of the workplace and I enjoyed how you got us to give feedback to each other. That was a really interesting element that I felt helped students prep for the real world. As someone who is dyslexic, I also felt that this assignment was learning disability friendly which I rarely come by."* (Student 48).

Furthermore, if students have the same partners for group work across several modules, they may be tempted to carve up the work on an individual rather than a team basis, which defeats the purpose of PAPBL. It is also less likely that a student will report issues of non-contribution if placed in a group alongside his/her close associates, so that is a further reason to not permit self-selected groups.

### ***Experiences of PAPBL between Groups***

Overall, students were very positive about the quality of feedback that they obtained from other groups.

*“The feedback received was very much constructive, easy to read and understandable with clear suggestions on how we could better improve the overall assignment.” (Student 12)*

*“When we gave our feedback to other peer groups, we got to know about a different way of doing things ... And when we received feedback from peers on our work, we got to know the mistakes we did throughout the different sections of the assignment.” (Student 193)*

*“The feedback from other groups helped us identify gaps in our assumptions, solutions and places where we can improve. Feedback from a different group is always important as it provides a different perspective on our solutions.” (Student 127)*

However, in a small number of cases, similar to experiences in previous studies (Glynn et al., 2006; Alkhalifa & Devlin, 2021), the feedback received was inadequate, unhelpful or not credible.

*“I did not think other students reviewing our paper helped as the ones that we viewed were not completed.” (Student 38)*

*“I think this could be improved by submitting our final draft to our lecture and not send it to other students as not everyone acted accordingly for this part of the assignment.” (Student 131).*

### ***Level of Support from Faculty***

As regards the amount of guidance provided by the teaching staff, close on half of the class (44%) were of the view that it forced them to learn things on their own, which of course was the intention. Responses on this question were quite guarded, with 29% opting for the neutral midpoint of the scale and a quarter of students disagreeing.

However, when asked if the staff should have provided more guidance, just 9% felt so, with 63% in disagreement and 29% sitting on the fence. Assuringly, 92% of respondents agreed that the teaching staff were satisfactorily responsive to questions that they or their colleagues raised. This was further borne out by comments in the individual reflections:

*“It was done very well. Our lecturers was very helpful throughout the duration of the assignment, giving clear direction. Even if it was just one student asking a particular question, a reply email to that question was sent out to all students, so everyone would get the same information.” (Student 44)*

*“The process was new for me, but it was a worthwhile experience as I got to learn a lot. The guidelines defined by the professors were very straightforward and clear cut.” (Student 147)*

Even though the lectures relevant to the assignment were recorded and made available on-line, as well as a dedicated Q&A session specifically focused on the assignment, a small number of students still felt they needed more clarity:

*“Maybe a tutorial lecture before the assignment based completely on the assignment.” (Student 98)*

*“I would have liked more guidance on how to make the assignment or maybe a demo of building a assignment from scratch.” (Student 193)*

A number of students also expressed the opinion that they would have liked if lecturers or monitors/tutors could have provided more specific feedback:

*“Apart from getting and giving peer feedbacks, a direct and logical feedback from the the professors would help us to improve better as it would provide us the exact idea of were we went wrong and were we should improve.” (Student 170).*

*“An in-person discussion with monitors would have been enjoyable and productive.”* (Student 79)

The practical difficulty in facilitating this request was the sheer volume of material to be assessed (over 1000 pages), so providing detailed formative or summative feedback would be immensely time-consuming and therefore not feasible. Instead, general points of summative feedback were given to the class on frequent mistakes made and areas for improvement. While the overall standard of submissions received was very high, marks were lost for a number of common reasons including: technical errors (e.g. ‘black’ or ‘gray’ holes on DFDs, incorrect use of UML modelling concepts, etc.), overly elaborate diagrams that were too complex, failure to adequately explain assumptions and design rationale, failure to adequately explain how the group responded to peer feedback received, and poor presentation.

### **Lessons Learned and Future Changes**

In reflecting on the outcomes of this inter-module PAPBL exercise, it is useful to recapitulate its underlying motives:

- To enable students form a better understanding of how business process models (taught in the Systems Analysis module) and data models (taught in the Database Technologies module) dovetail together;
- To provide students with an opportunity to develop ‘soft’ transversal skills such as teamwork and inter-personal communication, analytical reasoning, innovative problem-solving, entrepreneurial agility, and critical thinking;
- To facilitate students in ‘learning to learn’ and ‘learning to explain’;
- To expose students to group work in diverse environments (i.e. national culture, disciplinary background, life experience, etc.), wherein they must learn to respect the alternative opinions and perspectives of others.

Additionally, the decision to introduce PAPBL was mindful of:

- The need to provide students with timely formative feedback on their draft submissions within a very large class;
- The need to have reasonable controls in place to assure academic integrity (i.e. fair contribution and level of participation, no copying of others work, no outsourcing to on-line ‘homework help’ sites).

Overall, going by responses received to the survey and in the reflective pieces, students were overwhelmingly satisfied with their experience and the exercise seemed to go a long way towards achieving the aforementioned purposes. That said, a well known limitation of any PAL initiative is that peers are not professional teachers (Callese et al., 2019). A number of students indicated that they would have liked more guidance as regards what was expected from them as peer assessors. In retrospect, it would have been better if the lecturer took a small sample of the draft assignments and critiqued them in class for all to see, giving examples of useful feedback (as well as less useful feedback).

A surprising observation amongst a class of technically-adept students was that very many of them were not as literate as expected in the use of technologies for tasks such as collaborative document editing and collaborative diagramming. Students need to be shown how to pivot their group activities from face-to-face to on-line environments, as was necessitated at very short notice by the COVID-19 pandemic and again, in this case study, by a very disruptive cyberattack.

A few students suggested that groups should not be randomly formed, but purposefully chosen by the lecturer:

*“Divide people up according to their backgrounds. I was lucky to be in a team where we all came from different disciplines.”* (Student 189).

*“Groups can be built with more members of varied experiences/fields/experience on either of the two subjects.”* (Student 6).

*“Perhaps make teams of people from different backgrounds (IT, management, etc.) to give everyone a chance of meeting all kinds of people.”* (Student 140)

This is a very valid suggestion but – based on the author’s prior attempts to do this – not as straightforward to implement as it may seem. With several variables to juggle, and usually with incomplete information to hand, trying to ‘match’ students is quite complicated and the results of such efforts are not guaranteed to be any fairer or diverse than a random process.

Another suggestion that came from students was to introduce peer review earlier in the assignment:

*“It would be great to see this used at an earlier stage rather than a later stage of the assignment.”* (Student 9).

*“Instead of one assignment deliverable, if it was a continuous process, it would be more useful.”* (Student 165)

*“If we could divide break the assignment into smaller milestones (e.g. 2 or 3 diagrams a week) and if peers were asked to provide feedback on a weekly basis, then students could collaborate well and may provide better suggestions as it would give them more time to understand because they would only have to digest things in smaller bites as opposed to getting a large document all at once.”* (Student 164)

This suggestion, again, is worth considering, but a delicate balance has to be struck between using PAPBL as a mechanism to help students improve their submissions, as opposed to a way that lazy individuals can just mimick the work of others. By leaving the window for preliminary peer feedback close to the final deadline, the scope for ‘free-loading’ was reduced but not eliminated. It was evident from survey comments that a small number of groups did not perform their part of the bargain, either by failing to submit sufficiently complete draft work or by providing no or unhelpful feedback. These evaders could be reeled in by asking all groups to submit their draft versions into the system (in advance of submitting the final version). This would enable spot-checks to be performed to ensure that all groups made a genuine effort. It would also enable a comparison to be done, if necessary, between draft and final versions, as well as similarities with the four other assignments that any given group saw.

Making the peer evaluation process anonymous may also have improved its efficacy, as previously noted by Sindre et al. (2003), but to do so would require the use of a suitable submission system, adding further administrative work onto the lecturer (although, perhaps, existing solutions such as open source paper review systems could have been adapted to this purpose).

Finally, the various controls that were in place to assure academic integrity seem, by and large, to have worked. However, detecting plagiarism of software diagrams is tremendously difficult and cannot be easily done by tools such as Turnitin. Much depends on the lecturer’s sharpness and ability to recognise tell-tale signs that suggest collusion. The use of paid ‘homework help’ sites is another problem (e.g. requests for solutions were anonymously

posted on both Chegg and TransTutors.com, containing the precise wording as in the assignment specification). This was a disappointing discovery but the assignment only made up a portion of the overall marks for the two modules, so any student who cheated on the assignment was likely to do less well on the end-of-semester written test which examined knowledge of the same material. Using a well-known case study probably exacerbated this problem so a future lesson would be to use bespoke cases, either written by oneself or else suitably modified versions of published cases.

### **Conclusion and Next Steps**

This paper reported on the experiences, from both students' and lecturers' points of view, of using a peer-assisted problem-based learning (PAPBL) approach to teach two complementary postgraduate modules in Database Technologies and Systems Analysis. The feedback received from students, as well as the lecturers' reflective observations, was largely positive but a number of possible areas for future refinement and improvement were identified. The next stage of this research will be more detailed statistical analysis of the quantitative survey data to explore factors and correlations, as well as open and axial coding of the extensive qualitative comments contained within the students' reflective pieces.

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***Demand for and Supply of Trade/Entrepreneurship Subjects Teachers in  
Public Secondary Schools in Oyo State, Nigeria***

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**Abstract**

The study investigated the demand for and supply of trade/entrepreneurship subjects' teachers in public senior secondary schools in Oyo State, Nigeria. The concerns about the need for and the availability of teachers of the subjects served as the motivation for this study. Three hypotheses stated in null form guided the study. The descriptive research design carried out ex post facto was adopted for the study. The study population comprised all trade/entrepreneurship subjects' teachers in all public senior secondary schools in Oyo State, Nigeria. The sample size was 387 Trade/Entrepreneurship subjects' teachers selected from 45 Public Senior Secondary Schools across the six Education Zones in the state using the purposive and proportionate stratified sampling techniques. An adapted (Osuchukwu, 2021), validated and reliable ( $r = .93$ ) instrument titled "The Demand for and Supply of Trade/Entrepreneurship Subjects Teachers Questionnaire" (TDSTESTQ) was used to generate data for the study. Data collected was analysed using mean and standard deviation to answer the research questions and the hypotheses were tested using Pearson Product Moment Correlation Statistical tool. The findings of the study showed that there was a moderate, positive and significant relationship between the status of the Trade/Entrepreneurship subjects in the curriculum and the supply of its teachers; there was a strong, positive and significant relationship between Government policy on teacher qualification and the supply of Trade/Entrepreneurship subject teachers in the schools; and there was a moderate, positive and significant relationship between class size and the supply of Trade/Entrepreneurship subjects teachers. It was recommended among others that teacher training institutions should mount courses in different areas of the trade subjects in addition, government should ensure compliance with the policy on minimum teaching qualification by ensuring that only professionally qualified teachers are engaged in schools to teach the subjects.

**Keywords:** Demand for, Supply of, Trade Subjects Teachers, Public Secondary Schools

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## Introduction

Education is one of the fundamental institutions entrenched for the society for meeting its all-important needs. It is a process through which the expertise, personality and conducts of people are moulded and modelled. Education is expected to advance the awareness of the people. Ojo and Osoba (2019) assert that for a long time, education has been recognised as a mechanism for the advancement of national development and expectations of countries from its citizenry with regard to education is generally enshrined in the national policy on education. The continued existence of a society is no doubt hinged on its system of education which basically has to do with making the young ones to get ready for adulthood. For sometimes now, the concerns about the standard of living and the utilitarian nature of education have become emergent among different stakeholders in education. Specially, the Nigerian Government is making efforts moving the nation towards the industrial, technological, vocational and entrepreneurship advancement, hence, the Federal Republic of Nigeria (FRN) (2013) in the National Policy of Education has identified education as an instrument ‘par excellence’ for effecting national development.

Okafor (2011) further notes that in Nigeria, education is considered as a noteworthy factor in the attainment of accelerated and worthwhile changes that engender the advancement of the country’s socio-political, economic and human capital. This is clearly evident in the National Policy of Education in addition to the other different efforts that have been put in place towards the implementation of the policy. For the enhancement of the effectiveness of an educational system, there is need to fashion out the curriculum in a manner that will appropriately serve the societal needs. Consequently, Nigeria as a country over the years has witnessed reforms in the curriculum of its educational institutions with a view to providing the learners with the appropriate contents for job creation and wealth generation, even with or without securing salaried employment. Regrettably, as observed by Oyetakin and Ishola (2018), the curricular had not been implemented in all respects and the consequence has been ill-conceived knowledge, owing to the fact that the quality of knowledge and competence imparted to the learners cannot be assured.

The adoption of the home grown National Economic Empowerment and Development Strategy (NEEDS) by Nigeria, is a response to the societal reforms and primitive climate across the globe. The significant components of NEEDS are the people’s empowerment through education, job and wealth generation, value turnaround as poverty elimination. The realisation of this requires laying emphasis on innovative reasoning, possession of entrepreneurship and job-related prowess, etc.

At present in Nigeria, secondary education is organised into two phases, with each making up of three years of junior and senior secondary education, the curricula of which academic and pre-vocational in outlook. As enunciated in the National Policy on Education (FRN,2013), the curriculum of the senior secondary education is tailored towards the preparation of letters for higher education in addition to laying a reasonable footing for sustainable living, poverty elimination, job creation, wealth generation and value re-orientation which are the four centres of attention of the National Economic Empowerment and Development Strategies (NEEDS).The need to actualise this led to the incorporation of trade/ entrepreneurship subjects into the curriculum. The subjects which are 34 in number are : auto-body repair and spray painting, auto electrical work, auto mechanical work, auto parts merchandising, air conditioning/refrigerator, welding and fabrication/engineering craft practice, electrical installation and maintenance work, radio, television and electrical work, block laying, brick-

laying and concrete work, painting and decoration, plumbing and pipe fitting, machine wood working, carpentry and joinery, furniture making, upholstery and catering crafts practice. Others are garment making, textile trade, book-keeping, tourism, GSM maintenance, mining, photography, animal husbandry, fisheries, marketing, salesmanship, keyboarding, data processing, shorthand, cosmetology, printing and practice, dying and bleaching, leather goods and manufacturing and repair.

Administrators of senior secondary schools are required to provide opportunity for students to offer these subjects. Specifically, every child is expected to offer these subjects due to their status as cross-cutting subjects. It is worthy of note that the trade/entrepreneurship subjects offered by schools depends on many considerations such as the availability of resources (human materials, finance and time), the requirements of the host community of the school and the foresightedness of the school. The role of the teachers in the implementation of any curriculum cannot be underplayed. This is why Akande (as cited in Adekunle, 2012) has regarded the teacher as the principal factory operator in the '*educo-manufacturing*' process, and their services are no doubt a decisive factor in the production of learners as outputs of the school system who are adequately provided with the appropriate knowledge to be useful the community, they live in, hence, the quality and quantity of teachers are crucial to the attainment of the purpose of incorporating the trade subjects into the curriculum of the senior secondary schools in Nigeria.

The demand for the trade subject teachers as a variable in this study is indicative of the quality and quantity of the teachers required to teach the subjects in senior secondary schools. Gerald and Hussar (as cited in Basake, 2013), point that the major determinant of needs of teachers in the educational system are the number of teachers leaving the system and need to be replaced, as well as the number needed due to the growth or reduction in students' enrolment. Other determining factors according to Lassa (2000) include class size and teaching responsibilities as well as the required time for learning. It also involves the organisation of curriculum and educational plans, the entry age of compulsory schooling and academic standards describing graduation pre-requisites.

In educational institutions, the need for teachers is determined by the number of subjects in the curriculum and the number of manpower inputs by the teachers. Essentially these elements are decided by the ministries of education and school administrators (Adeyemi, 2006). Therefore, the demand for Trade Project teachers could be influenced by the nature of the subject, governments' policy on teacher qualification, class size and student's learning outcomes.

On the other hand, the supply of trade subjects' teachers means the quantity and quality of teachers that are available or are within the easy reach of the schools for the teaching of the subjects. Dike (2002) regards the availableness of trade subject teachers as the quantity and quality of teachers to be engaged to provide the appropriate learning experiences to the students. Agabi (as cited in Osuchukwu, 2021) opines that the availableness of trade teachers is determined by factors such as inadequate supply of technical and vocational teachers from the source of production, that is the educational institutions' unattractive remuneration, inadequate incentive packages, and changes in educational policies.

In the opinion of Akinsolu (2011), labour market is a situation in which the manufacturer and the prospective employees are provided to meet one another with the aim of engaging and rendering services for production purpose. The interplay between the demand and supply in

the labour market is a determinant of the remuneration system. When this is applied to education, the market place for teachers is the educational system, and with the opinion of this scholar, it could be observed that despite the contemporary digital era, teachers will continue to be regarded as an indispensable human resource in the educational system in view of the fact that the effectiveness of the school system is dependent on the extent of provision, standard, and competence.

In a study to determine the readiness of the Lagos state government in the provision of resources for the implementation of the new curriculum of the senior secondary schools, Adedeji and Adekunle (2018) found that the provision of teachers for the new subjects was inadequate and that the provision of instructional materials had significant effects on the implementation of the curriculum. Relatedly, Ihume and Nwafor (2018) investigated the appropriateness of trade subjects' teachers in public secondary schools in Rivers State, and discovered among others that there was adequacy of teachers for a few trade subjects with requisite educational qualifications. The study further showed that there was no evidence of teachers teaching, or students learning a large number of the trade subjects, due to the non-availability of qualified teachers.

Uwaoma, Uma and Nwose (2019) investigated the relationship between educational infrastructure and the effective teaching of trade subjects in Ebonyi state, Nigeria and discovered that only few schools had the listed facilities and the applicable ones were not put into use due to the non-availability of teachers for the subjects. Amuyo (as cited in Jamoh and Surajo, 2021) studied the correlation between the supply of quality teachers and the execution of the secondary school curriculum in Nigeria. The finding indicated that a direct and positive relationship existed between the accessibility of subject teachers and the execution of the Secondary school curriculum. The study further showed that the available teachers concentrated more on the theoretical aspects of the subjects in their classroom teachings at the expense of the practical aspects.

From the foregoing, it is evident that teachers are the fulcrum on which the efficient execution of the new curriculum is hinged upon. Therefore, insufficient supply of teaching staff will definitely be a clog in the wheel of the attainment of goals of any educational system. For effective implementation of any curriculum. As noted by Ali and Ajibola (2015), most of the time, teachers are constrained to teach subjects outside their areas of specialization and expertise.

It is against this backdrop that the study investigated the need for and the availability of trade subjects' teachers in Public secondary schools in Oyo State, Nigeria.

### **Statement of the Problem**

The need to increase the extent of employability of graduate of educational institutions in Nigeria, especially secondary school leavers has necessitated the introduction of 34 new trade subjects into the curriculum of the senior secondary schools in the country. The role of qualified teachers in the actualisation of this cannot be underplayed. It has however, been observed by the researcher that there seems to be a mismatch between the need for the teachers of the trade subjects and the availability of teachers of trade subjects in the schools. In some schools, non-professional teachers or non-experts were hired to pass instructions to the students on the trade subjects which in most cases are theoretical with less emphasis on practicals. The status of the subjects as compulsory cross cutting, of which has to be offered

by every student has also increased the workload of the few available teachers, and in some cases the subjects are under-represented in the schools' time schedule; hence, in most public secondary schools, the class size for the trade subjects is usually in far excess of the recommended teacher student ratio of 1:40 in the National Policy on Education. These are assumed to have implications on effective teaching and learning of the trade subjects, hence, defeating the purpose of inclusion of the subjects in the curriculum. It is consequent upon these that the researcher considers it desirable to evaluate the demand for and the supply of trade subjects' teachers in public secondary schools in Oyo state, Nigeria.

### **Purpose of the Study**

The study is set to achieve the following objectives:

1. To determine the relationship between the status of the Trade/Entrepreneurship subjects in the curriculum and the supply of teachers in the schools
2. To evaluate government policy on teacher qualification in relation to the supply of Trade/Entrepreneurship subjects' teachers in the schools.
3. To examine the relationship between the class size for trade subjects and the supply of teachers for the Trade/Entrepreneurship subjects in the schools.

### **Research Hypotheses**

The following null hypotheses were postulated and tested at .05 level of significance:

1. There is no significant relationship between the status of the Trade/Entrepreneurship subjects in the curriculum and the supply of teachers.
2. Government policy on teacher qualifications and the supply of trade subjects' teachers are not significantly related.
3. There is no significant relationship between class size and the supply of trade subjects' teachers.

### **Methodology**

A descriptive research design carried out ex-post facto was adopted for the study. The population comprised all trade/ entrepreneurship subjects' teachers in all public senior secondary schools in Oyo State, Nigeria. The study population comprised all Trade/Entrepreneurship subjects' teachers in all public senior secondary schools in Oyo State, Nigeria. The sample size was 387 Trade/Entrepreneurship subjects' teachers selected from 45 Public Senior Secondary Schools across the six Education Zones in the state using the purposive and proportionate stratified sampling techniques. An adapted 25- item instrument (Osuchukwu, 2021) titled "The Demand for and Supply of Trade/Entrepreneurship Subject Teachers Questionnaire (TDFSTESTQ) was used to gather information for the study. The instrument elicited information on the variables of the study. The instrument was validated by Academic Staff in Economics Education and Educational Management, faculty of Education, University of Lagos, Nigeria. Test-retest reliability method was used in pilot-testing the instrument and a correlation co-efficient of .93 was obtained. Due to the high level of coefficient, the instrument was adjudged to be reliable. Five trained research assistants were used for the administration of the instrument. Data collected was analysed using mean and standard deviation to answer the research questions and all the hypotheses were tested using Pearson Product Moment Correlation Statistical tool.

## Results

**Hypothesis 1:** There is no significant relationship between the status of the Trade/Entrepreneurship subjects in the curriculum and the supply of teachers.

The hypothesis was tested using Pearson Product Moment Correlation statistical tool, the result is presented in table 1

Table 1: Status of Trade/Entrepreneurship Subjects in the Curriculum and the Supply of Teachers

Variables	Mean	SD	N	DF	R	P	Remark	Decision
Status of Trade/Entrepreneurship Subjects	15.29	5.21	387	385	0.68	.00	Sig	Reject Ho <sub>1</sub>
Supply of Teachers	13.46	4.21						

$P < 0.05$ ,  $df = 385$

Table 1 shows a moderate, positive and significant relationship between the status of Trade/Entrepreneurship subjects and the supply of teachers ( $r = .68$ ;  $df=385$ ;  $p<.05$ ). Thus, the null hypothesis which states that there is no significant relationship between the status of Trade/Entrepreneurship subjects and the supply of teachers was hereby rejected. It therefore, implies that a significant positive relationship existed between the status of Trade/Entrepreneurship subjects in the curriculum and the supply of teachers for the subjects.

**Hypothesis 2:** Government policy on teacher qualifications and the supply of trade subjects' teachers are not significantly related.

The hypothesis was tested using Pearson Product Moment Correlation statistical tool, the result is presented in table 2

Table 2: Government Policy on Teacher Qualifications and Supply of Trade/Entrepreneurship Subject Teachers

Variables	Mean	SD	N	DF	R	P	Remark	Decision
Government Policy on Teacher Qualifications	22.07	5.43	387	385	0.76	.00	Sig	Reject Ho <sub>2</sub>
Supply of its Teachers	13.46	4.21						

$P < 0.05$ ,  $df = 385$

The findings of the test of hypothesis 2 as indicated in Table 2 shows a strong, positive and significant relationship between Government policy on teacher qualifications and supply of trade/entrepreneurship subject teachers in the schools ( $r = .76$ ;  $df=385$ ;  $p<.05$ ). Thus, the null hypothesis which states that the Government policy on teacher qualification did not have

significant relationship with the supply of Trade/Entrepreneurship subject teachers was rejected. It therefore, implies that Government policy on teacher qualification significantly related to the supply of teachers for the subjects.

**Hypothesis 3:** There is no significant relationship between class size and the supply of Trade/Entrepreneurship subjects' teachers.

The hypothesis was tested using Pearson Product Moment Correlation statistical tool, the result is presented in table 3

Table 3: Class Size and the Supply of Trade/Entrepreneurship Subjects' Teachers								
Variables	Mean	SD	N	DF	R	P	Remark	Decision
Class Size	13.48	3.38						
			387	385	.67	.00	Sig	Reject Ho3
Supply of its Teachers	11.94	3.11						

P<0.05, df= 385

Table 3 shows that a moderate, positive and significant relationship existed between class size and the supply of Trade/Entrepreneurship subjects' teachers ( $r = .67$ ;  $df=385$ ;  $p<.05$ ). Thus, the null hypothesis which states that there is no significant relationship between class size and the supply of Trade/Entrepreneurship subjects' teachers was rejected. It therefore, indicates that significant relationship existed between class size and the supply of Trade/Entrepreneurship subjects' teachers.

### Summary of Findings

1. There was a moderate, positive and significant relationship between the nature of the Trade/Entrepreneurship subjects and the supply of its teachers.
2. There was a strong, positive and significant relationship between Government policy on teacher qualification and the supply of Trade/Entrepreneurship subject teachers in the schools.
3. There was a moderate, positive and significant relationship between class size and the supply of Trade/Entrepreneurship subjects' teachers.

### Discussion of Findings

The result of hypothesis one showed that there was a significant relationship between the nature of Trade/Entrepreneurship subjects and the supply of teachers in public secondary schools in Oyo State, Nigeria. It could be inferred from this finding that the nature of Trade/Entrepreneurship subjects in terms of the practical aspects of the subjects, inadequate number of skilled teachers and the longer hours required to teach so that students can adequately internalize the contents determined the supply of these subjects' teachers to public secondary schools in the state. This finding corroborates the earlier finding of Adedeji and Adekunle (2018) where it was reported that there was a significant relationship between the

nature of Trade/Entrepreneurship subjects and the supply of its teachers in public secondary schools. It was reported that there was inadequate provision of teachers for the new subjects including Trade/Entrepreneurship subjects which has implications on the development of entrepreneurship education.

The second result indicated that a significant relationship existed between government policy on teacher qualification and supply of Trade/Entrepreneurship subjects' teachers in public secondary schools in Oyo State. This finding can be explained in the light of the fact that the minimum requirement for teaching according to the National Policy on Education (FRN, 2013) is the Nigeria Certificate in Education (NCE), and that all teachers at all levels of education shall be professionally qualified. This government policy on teachers' qualification has proven that the use of non-Education graduates or local artisans who are knowledgeable in certain Trade/Entrepreneurship skills in imparting these skills to students in schools in teaching the subjects is a clear departure from the provisions of the Policy document. This finding is in line with the findings of Ihueme and Nwafor (2018) who in their study reported that significant relationship existed between government policy on teacher qualification and supply of Trade/Entrepreneurship subjects' teachers. It was reported that a good number of teachers teaching Book Keeping, Animal Husbandry and Fishery did not have relevant qualifications from institutions of higher learning that certifies them to teach the subject.

Hypothesis three showed that there was a significant relationship between class size in Trade/Entrepreneurship subjects and the supply of teachers for the subjects in public senior secondary schools in Oyo State, Nigeria. This is an indication that large class size has implications on the quality of teaching and learning. Since Trade/Entrepreneurship subjects require practicals to help the students relate the concepts taught to real life situations, large class size calls for the supply of more teachers to teach the subjects in public secondary schools that are mostly crowded. This finding confirms the finding of Akinsolu (2011) which found that a positive and significant relationship existed between class size in Trade/Entrepreneurship subjects and the supply of teachers for the subjects. The finding is a pointer to the fact that the yearly average full time teacher pupil ratio was 1:72 in the urban areas, which indicated large class size.

## **Conclusion**

The findings of this study have indicated that the nature of Trade/Entrepreneurship subjects in terms of the practical aspects of the subjects, longer hours requirement and availability of adequate instructional materials are strong determinants in the supply of teachers in public secondary schools in Oyo State, Nigeria. Government policy of the Nigeria Certificate in Education as the minimum qualification for entry into the teaching profession and that all teachers at all levels of education shall be professionally qualified has made it an aberration to fully incorporate local artisans who are knowledgeable in certain Trade/Entrepreneurship skills in imparting these skills to students in schools. Since Trade/Entrepreneurship subjects require practicals to help the students relate the concepts taught to real life situations, large class size had a significant relationship with the supply of more teachers to teach the subjects in public secondary schools that are mostly crowded.

## **Recommendations**

Based on the findings of the study and the conclusion drawn therefrom, the following recommendations are made:



1. Government should employ more qualified Trade/Entrepreneurship teachers to teach in public secondary schools. Also, considering the practical nature and status of the subjects in the curriculum, a clear-cut policy should be put in place for the enlistment of local artisans/technicians who are knowledgeable in some Trade/Entrepreneurship skills as academic technologists employed on part time basis to teach the practical aspects of the subjects.
2. Teacher Training Institutions like faculties and Institutes of Education in Nigerian universities, Colleges of Education and Schools of Education in Polytechnics should mount courses in different areas of the trade/entrepreneurship subjects in order to boost the supply of professionally qualified teachers for the subjects. Government should ensure strict compliance with the policy on minimum teaching qualification by ensuring that only professionally qualified teachers are engaged in schools to teach the subjects.
3. There is the need to improve on the carrying capacity of public secondary schools through the provision of adequate and relevant educational infrastructure like classrooms and laboratories for practicals, since most of the subjects are practical-oriented. In addition, there is the need to maintain a right mix of teachers and students for the subjects through the recruitment of adequate number of teachers for the subjects. This will go a long way in maintaining the appropriate teacher-students ratio as recommended in the National Policy on Education.

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***Students' Perceived Barriers of the Use of OER:  
The Case of a South African Higher Education Institution***

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**Abstract**

Access to Higher Education plays an integral role in social and economic development and transformation. In South Africa, not only access to quality teaching and learning is influenced by the limited number of Higher Education Institutions (HEIs), but also access to resources. For HEIs in developing countries alternative resources than a prescribed book should be used to facilitate the teaching and learning of the academic programmes. Open education resources (OERs), as a teaching and learning tool, can assist lecturers to achieve the learning outcomes and facilitate the development of innovative teaching and learning approaches. Furthermore, the use of OERs can create opportunities for students in HEIs to increase their engagement with the discipline specific content. However, there are also several barriers that can hinder students in HEIs to capitalize on these opportunities. This study investigated the perceived barriers of the use of OER at a South African HEI. A self-administered online questionnaire was distributed in order to determine the perceived barriers of first year students completing a business management module at a South African HEI. Overall, 287 completed questionnaires were included in the data analysis. The results indicated the main factors that act as perceived barriers were social barriers, coursework barriers and technology concerns. The HEI should consider allowing for social interaction when OER is integrated in coursework, with adequate face-to-face sessions to enhance the learning experience of students.

Keywords: Perceived Barriers, Open Education Resources, Higher Education, South Africa

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## Introduction

The learning and teaching environment is changing due to the development and use of open educational resources (OERs) in various sectors, and the fusion of technology and creativity has made open education a growing trend over the last decade (Berti, 2018).

Different definitions of open education (OE) are accommodated within the general phrase "open education". In a study conducted by Dos Santos *et al.* (2016), OE is described as a teaching method that frequently uses digital tools. Furthermore, by reducing obstacles and ensuring that learning is available, plentiful, and customizable for everyone, the goal OE is to increase access and engagement for all by providing several opportunities for knowledge creation, knowledge sharing, and instruction. Additionally, it offers numerous entry points to both official and informal education and connects them (Dos Santos *et al.*, 2016).

The Hewlett Foundation more specifically describes Open educational resources (OER) as teaching, learning, and research materials in either digital or analog form, that is in the public domain or that are distributed under an open license. The use of OER may include no or few restrictions in the re-use and sharing of the material. McGreal (2004) defined OER as any digital content that can be re-used in a lesson, where the lesson may be organized into several units or modules or complete programs. Although different communities have varied definitions of OERs, the acceptable definition developed by UNESCO (2015) defines OERs as educational resources that are freely accessible for use by teachers and students without the monetary requirements or restrictions implied through royalties or license fees (Berti, 2018).

In relation to this, open educational practices (OEP) are methods that respect and empower learners as co-producers on their lifelong learning pathways, encourage innovative pedagogical models, and facilitate the (re)use and production of Open Educational Resources through institutional regulations (Ehlers, 2011). OEPs are typically acknowledged as possible facilitators of effectiveness, accessibility, and quality in HEIs (Weller, 2014).

OERs are quickly becoming crucial components in higher education. The integration and the use of OERs in HEI curriculums typically promote open educational practices (OEPs) and the open education movement (Berti, 2018). However, the number of HEIs that promote openness through official open education policies is still inadequate (Souto-Otero *et al.*, 2016). Even more so, the limited number of HEIs that emphasizes the development of lecturers' knowledge, motivation, and capacity to operate in the open education environment and increase the mainstream adoption of OEP is also concerning (Nascimbeni, 2015). Integrating OE and OERs is essential for HEIs as it serves as a stimulus for teaching and learning innovation using digital technology (Dos Santos *et al.*, 2016).

It is important to recognize the significance of OERs as educational tools that can support the global expansion of learning (McGreal *et al.*, 2013). An essential prerequisite for promoting the use of the content for education is the flexibility that openly licensed content offers in terms of both technology and law. The educational value of OERs and OEPs is fundamentally grounded in the idea of employing open-access materials as primary components of the academic curriculum (McGreal *et al.*, 2013; Berti, 2018). OE enables individuals to satisfy their educational needs at different life stages through accessing relevant and worthwhile educational opportunities for professional growth (Dos Santos *et al.*, 2016). OE provides flexible access to information, courses, support, evaluation, and certification (Dos Santos *et al.*, 2016).

Some of the advantages of the use of OERs include that access to free, high-quality, and affordable educational materials might increase fairness and performance in HEIs, OERs increase collaboration amongst peers, enable the user to develop modification capabilities, it expands the access to education, and implies cost reduction in access to education (Morris, 2019).

Over the past decade, OERs have grown steadily. Currently, there are creative and innovative OE projects taking place in HEIs all over the world. However, although the use of OER boasts several opportunities and advantages when considering the use of open resources in higher education, particular crucial challenges also exist (Berti, 2018).

According to Berti (2018), the barriers implied by using OER relate to the technical, economic, social, and legal domains. Although access to resources at any time and almost any place fundamentally enhances social equity through OE, not everyone may have access to broadband and other digital tools required to access open educational resources (OERs) (Berti, 2018). In addition, students and lecturers might not have the required and necessary technical skills to use the devices on which open materials are made available. In order to address this issue, it is imperative for HEIs to provide expert knowledge and assistance to help both students and lecturers successfully and seamlessly progress toward the use of OERs (Berti, 2018). Morris (2019) recognizes that barriers to using OER may include aspects such as concerns about the quality and reliability of the material included in the OER, as well as technology issues that may have a direct influence on the usability of the OERs.

### **Contextualising the use of OER in the South African HEI**

The North-West University (NWU) is an HEI in South Africa. The NWU is a unitary, multicampus HEI with campuses (Potchefstroom, Vanderbijlpark, and Mahikeng) in two different provinces (North-West and Gauteng) in South Africa, providing education in two teaching modalities: contact (face-to-face) and online (distance) (NWU Statute, 2017). Furthermore, the NWU as HEI aims to differentiate itself from its competitors for active scholarship and academic success. It also shows a desire to succeed in innovative teaching and learning practices in both the service delivery modalities offered.

The Faculty of Economic and Management Sciences is one of the eight faculties within the NWU. This faculty offers HE in fields such as management sciences, accounting sciences, economic sciences, industrial psychology, human resources management, and tourism management. One of the modules introduced in the first year of study within the faculty is Introduction to Business Management (BMAN111). The use of OERs was integrated with the BMAN111 module to ensure that students:

- experience innovative teaching and learning practices;
- develop autonomous learning skills where they can construct knowledge and understanding from different sources; and
- are enabled to take responsibility for their learning process.

A micro-course was developed based on specific content and outcomes within the BMAN111 module. This micro-course was hosted on the OERu-platform and students registered for the BMAN 111-module at the NWU was required to complete this micro-course within a 14-week time frame, at their own pace. The BMAN111 micro-course consisted of 6 learning pathways, each with its own outcomes and quiz that was used for assessment purposes. Although the micro-course was hosted on the OERu-platform, the quizzes for each learning

pathway was developed and hosted on the NWU Learner Management System (LMS). To successfully complete the BMAN111 micro-course, students not only had to work through each learning pathway and complete the quiz, but they also had to pass all the quizzes, and the results for each learning pathway quiz were calculated to determine a percentage that contributed 10% toward their final mark for the module.

In March 2020, the COVID-19 pandemic forced the HEI to move all teaching and learning efforts online. As a result, students registered for the BMAN111 module had to complete all their modules now online. The five weeks prior to the lockdown caused by the COVID-19 pandemic, students only had the OER component of the BMAN111 module to complete online. All other modules were thus presented in a face-to-face teaching modality before the COVID-19 pandemic. The COVID-19 pandemic resulted in emergency remote online teaching and learning at the NWU. This had to affect that students had to manage and complete all their modules online, which may have directly impacted their perceived barriers to using OER.

### **Research methodology**

This study sought to analyze the perceived barriers that prevent students at a South African Higher Education Institution (HEI) from using OER in for learning. For this study, a single cross-sectional technique and a descriptive research design were used.

### **Sampling Method**

The target population for this particular study was first year students at a South African HEI. The scholars who made up the target demographic were full-time students attending a South African university in two Provinces: Gauteng Province and the North-West Province. Thus, two of the campuses of the HEI made up the sampling frame. In the primary study, where a quantitative research methodology was used, 287 undergraduate students were included in a non-probability convenience sample. Additionally, a positivist strategy was used to assure the researcher's objectivity toward the study, data collecting, and research itself (Collins, 2010; Remenyi, et al., 1998). For the empirical part of this investigation, a descriptive research design was used.

### **Research instrument and data collection**

To gather the information required for this investigation, a semi-structured, self-administered questionnaire was developed and distributed. This was done in order to analyze the factors that act as perceived barriers towards the use of OER among students at a South African HEI from. The questionnaire parts were designed to collect information on certain demographic factors, and the respondents' perceptions of barriers in the use of OER. Twenty-four items were included in the questionnaire and analyzed based on students' perceived barriers of the use of OER, on a four-point Likert scale without a neutral point. This was done to encourage adherence to a particular viewpoint regarding the questionnaire item (Croasmun & Ostrom, 2011).

### **Sample description**

A total of 287 questionnaires that were completed and suitable for inclusion in data analysis. In the sample, there were more female participants (70.4%) than male participants (29.3.0%).



Only 1 participant (0.3%) indicated the non-binary option. Descriptive statistics were utilized to show a demographic breakdown of the respondents. The items included to determine the perceived barriers to the use of OER were also interpreted and investigated using exploratory factor analysis. Participants in this research study gave their consent before taking part. To safeguard the privacy and identification of the respondents participating in this study, no pertinent personal information was collected from them through the questionnaire.

### **Data analysis**

Following the coding of the completed surveys, the data was captured in Microsoft Excel. From there, Version 25 of the Statistical Package for Social Sciences (IBM SPSS) for Windows was used to process and analyze the data. Reliability and validity analyses, descriptive analyses, and exploratory factor analyses were included in the statistical analysis of the data collected for this study.

### **Reliability and Validity**

The Kaiser-Meyer-Olkin measure of sample adequacy and the Bartlett's test of sphericity were studied and utilized to determine the viability of principle components analysis for the exploratory factor analysis. The data gathered to ascertain the perceived barrier to the use of OER by students yielded a Kaiser-Meyer-Olking score of 0.957, proving to be highly acceptable (Field, 2009). At 0.0000, the Bartlett test ( $p < .00001$ ) was also found to be significant (Pallant, 2005). The exploratory factor analysis revealed three factors based on similarities between the items included to determine students' perceived barriers to the use of OER. Small correlations between the factors were revealed, indicating the individuality of the factors. Loadings of 0.45 and higher were typically used for item inclusion. Furthermore, an eigenvalue of 1 was used for factor extraction criterion. This is supported by Maree (2007). The eigenvalues of the factors included in this study ranged from 1.154 to 13.690. The three factors identified represents 69% of the total variance explained and the factors were labelled according to similar features of each item included in the specified factor.

### **Results and discussion**

Based on the questionnaire's four-point Likert scale, categorized items were used to identify each of the aforementioned variables. The Likert scale ranged from 1 (which represents 'completely disagree') to 4 (as 'completely agree'). Additionally, mean values for each factor were calculated in order to assess the relative importance of each factor identified. The following sections will provide an overview of the descriptive results of the sample demographic, as well as the results of the exploratory factor analysis.

### **Demographic profile of respondents**

From the 287 questionnaires included in data analysis, it is clear that the majority of the respondents from the sample were female (70.4%). Table 1 provides an overview of the aspects included in the demographic sections of the questionnaire.

Item	Variable	%
Sex	Female	70.4%
	Male	29.3%
	Non-binary	0.3%
Do you consider yourself as a digital native?	Yes	82.9%
	No	17.1%
How would you describe your ability to use technology?	Basic knowledge	28.9%
	Limited experience	19.9%
	Experience in practical application	34.1%
	Advanced skills and experience	13.9%
	Expert in the use of technology	3.1%
Were you familiar with open educational resources before the BMAN 111 module?	Yes	53.7%
	No	46.3%
Have you used any open educational resources before the BMAN 111 module?	Yes	40.1%
	No	59.9%
Have you ever used any other technologies for academic purposes, before BMAN111?	Yes	42.9%
	No	57.1%

Table 1: Demographic profile of respondents

From Table 1 it is clear that 82.9% of the respondents consider themselves digital natives. This refers to a person who was born or raised in the digital era and has had early exposure to computers and the internet. Furthermore, 34.1% of the respondents indicated that they have experience in the practical application in using technology, with only 19.9% indicating they have limited experience with the use of technology, and 13.9% indicating they have advanced skills and experience with the use of technology. The majority of students were familiar with OER before the use thereof in the BMAN111 module (53.7%) and only 40.1% indicating that they have used OER before the BMAN111 module. Forty-two-point-nine percent respondents also indicated that they have used other technologies for educational purposes, with the main technologies being social networking platforms such as WhatsApp and YouTube.

It is important to note that not all the respondents who participated in the research study completed the Micro-course and the quizzes included for assessment purposes.

Did you complete the BMAN 111 OERu micro-course successfully?	Completed the whole Micro-course and all quizzes	84%
	Did not complete the Micro-course or the quizzes	8.0%
	Completed the Micro-course and quizzes partially	8.0%

Table 2: Completion of the Micro-course

From table 2 it is evident that 84% of the respondents completed the micro-course and all the quizzes included for assessment purposes. In total, 16% of the respondents either did not complete any part or quiz of the micro-course (8.0%) or only completed the micro-course or the quizzes partially (8.0%).

## Exploratory factor analysis for perceived barriers of the use of OER

As mentioned above, three factors were identified for students' perceived barriers of the use of OER at a South African HEI. The factors were grouped together based on how comparable their features were. Social barriers (Factor 1), Technology concerns (Factor 2), and Coursework barriers (Factor 3) were identified as the perceived barriers. For each of the three factors, Cronbach's coefficients were investigated in order to assess the validity of the analyzed data and gauge internal consistency. The Cronbach's Alpha measurement for all three factors were acceptable and higher than the recommended limit of 0.7. (Field, 2009).

<b>Factor</b>	<b>Cronbach's Alpha</b>	<b>Inter-Item Correlation Mean</b>
Social Barriers	0.951	0.662
Technology Concerns	0.926	0.580
Coursework Barriers	0.875	0.586

Table 2: Exploratory factor analysis of students' perceived barriers of the use of OER

The first factor (Factor 1) labelled 'Social Barriers' included 8 items such as a lack of interaction with other students and lecturer, students felt isolated from lecturer and other students when using the OER, they were concerned about the validity of the form of teaching & learning and assessment that is done online rather than face-to-face, they experienced a lack of contact with other students, they were of the opinion that OER does not suit the way they prefer to learn, the impersonal nature of OER, the inflexibility of the course design, and they were concerned about the effectiveness of learning in isolation. This factor yielded the highest Cronbach's Alpha value (0.951) and inter-item correlation mean (0.662).

Factor 2 was labelled as 'Technology Concerns'. This factor yielded the second highest Cronbach's Alpha at 0.926 and the lowest inter-item correlation mean (0.580). Technology Concerns included six items: students experienced anxiety or stress related to the technology used, they experienced physical health barriers such as eye strain when using OER, students experienced various technical problems, they had an inability to work with computers, they experienced interruptions when completing the course, and they felt that they did not have the necessary information communication technology (ICT) skills.

The last factor identified was labeled 'Coursework Barriers' and yielded the lowest Cronbach's alpha (0.875) and second highest inter-item correlation mean (0.586). The items included in this factor were the fact that students found the amount of coursework they had to work through challenging, they felt it is not the right course for them, they experienced a lack of time to attend to the course, students experienced increased pressure of work in other modules, they found the content confusing, and finally they struggled to understand the content.

From the above it is clear that social barriers played the most significant role in students' perceived barriers to the use of OER. This implies that for the students registered at the South African HEI, one of the main role players in the preferred learning style is social interaction with their peers, as well as the lecturer. It is important to note that the integration of the use of OER in the first-year business management module (Introduction to Business Management) took place in the same semester that COVID-19 presented itself. These students were affected by this as there was a nationwide lockdown and the interaction with the lecturers and peers

were severely limited. It can therefore be assumed that the extent to which the COVID-19 pandemic limited social interaction among students (with reference to their academic work) played a significant role in how students perceived this as a barrier to the use of OER. Students did not have the opportunity to discuss the coursework included in the OER with their peers (which has a significant impact on how students construct knowledge of coursework) or their lecturers (where they can determine if they understand the coursework included in the OER).

Secondly, technology concerns also acted as a prominent barrier to the use of OER. Considering that HEIs' response to the COVID-19 pandemic and its impact on education was to continue with emergency remote online teaching and learning, it entailed that students had to complete the academic year in an online modality. Thus, students now had to complete all their modules online, whereas just some week prior to COVID-19 it was only some parts of some modules that included an online learning component. This logically relates to the anxiety and stress students experienced related to the use of technology, the physical health barriers such as eye strain from working longer hours on their computers, and various interruptions in their personal context as they attempted to complete the course.

With reference to the coursework barriers identified, students found this factor to play the least significant role in the use of OER. Thus, the social barriers and technology concerns were the two factors that influence their perceived barriers of the use of OER.

## **Conclusion**

From the literature based on previous research in the field of OER it is clear that OE enables HEIs to freely exchange educational materials or co-create them through open collaboration. The fact that educational content provided in the form of OERs decreases the limitations for the reuse and adoption of these materials attracts new audiences, such as students in HEIs. OERs furthermore enables flexibility in terms of how and when educational resources and instruction can be accessed as well as new methods of teaching and learning.

From the results of this study it is clear that the use of OER limits students' social interaction with their peers and lecturers, and that they have specific technology concerns when using OER for learning purposes. If the specific HEI in the South African context thus want to enhance the use of OER for teaching and learning purposes, it is important to include component in the integrations thereof that will allow for social interaction among the students (in the form of team work for example) as well as with their lecturers. Lecturers can, for example, ensure that they include Q&A sessions throughout the semester based on the OER-component of the module to guide students in the way that they construct knowledge and understanding from the coursework included in the OER, and also allow students to complete the OER micro-course in teams of 2-3 students. Future research possibilities exist as the OER Micro-course can be integrated again once the students return back to campus for normal face-to-face teaching modality and to compare the results with the results of this study to determine if the perceived barriers will differ if students now have less modules to complete in a fully online teaching environment (as was the case during the COVID-19 pandemic).

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***Preparing Higher Education Teachers for Successful Online Teaching:  
Where Does Your Students' Motivation Come From?***

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**Abstract**

The present study aims to 1) discover the source of higher education (HE) students' motivation and explore the basis of their motivation from their point of view, and 2) discuss the best practices and strategies employed by HE teachers to motivate their students in online or remote learning environments. The study's objective is to listen to the students' voices and suggest adding the best practices of motivating students to the teachers' professional development programs. For this purpose, the researcher organized a focus group of six experienced HE teachers from several HE institutions to find the best practices in online teaching environments and designed a students' survey to find the source of students' motivation from their point of view. A sample of 344 students responded to the survey, and the general results revealed that certain factors affected the students' motivation, such as their need for the course or the teachers' way of instruction. The results also showed that HE teachers found specific motivation strategies to be more successful than others in the online learning environment, these strategies include but are not limited to online collaboration, technology utilization and gamification, as well as other strategies. Based on the study's findings, it is recommended to update the HE teachers' professional development programs in terms of understanding the source of their students' motivation to cope with future teaching and learning challenges and changes with the overall aim to increase their students' motivation, especially in the online environments.

Keywords: Motivation, Higher Education, Online Learning, Remote Learning, Motivation

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## Introduction

Motivation is defined as “a theoretical construct to explain the initiation, direction, intensity, persistence, and quality of behavior, especially goal-directed behavior” (Brophy, 2010, p. 3). There are different types of motivation, and it is essential to have motivated students in any classroom, especially in higher education, to achieve better results. Without motivation, the teacher’s job becomes very challenging. It is worth mentioning that the concept of motivation is related to many theories such as “self-efficacy, goal theory, theories of intelligence, choice theory, self-determination theory, and flow, among others.” (Irvine, 2018, p.1). Although motivation is important for both teachers and students, this study focuses on students’ motivation and the strategies that HE teachers can employ to increase their students’ motivation, especially in online classrooms.

There has been a disagreement on the source of students’ motivation. In the existing literature, and there were two types of discussions. The first one assumed that students had intrinsic motivation, which was what kept them going. The second one assumed that the course design and the teachers’ performance played the most crucial role in motivating students, and these are some of the factors that represent extrinsic motivation. The main aim of the current study is to find out the factors that might lead to an increase or decrease in students’ motivation in the online classroom. The study also aims to find the techniques and strategies that were found helpful by teachers to increase students’ motivation in the higher education context with a focus on the online environment. The research questions proposed for the current study are (1)What is the source of students’ motivation in HE online classes? (2)What are the best strategies and techniques employed by HE teachers in online classes?

## Literature Review

### 1. Types of Motivation and their Significance in Higher Education

As stated earlier, there are two types of learning motivation: intrinsic and extrinsic. Intrinsic motivation is based on the students’ enjoyment or need for the topic or the class being delivered. On the other hand, extrinsic motivation is activated by external factors that might be introduced in the class, such as the course design, a reward system (Usmanovna and Oybekovna, 2018) or others. Both types of motivation are important because they can impact the students’ behaviour as well as their academic performance (Tokan and Imakulata, 2019). The focus of this study is to explore the factors that might impact students’ motivation when it comes to online learning. According to Afzal, et al. (2010), if students are motivated, this leads to better academic performance, which is the target of almost every educator. Therefore, HE teachers must be aware of the best strategies to motivate their students, especially in the online classroom. It is also essential for those teachers to listen to the students’ voices to understand their perceptions and preferences to create an enjoyable, beneficial and motivational online classroom experience. This way, not only will the students' motivation increase, but their academic performance will also improve.

### 2. The Role of HE Teachers in Motivating Students

Teachers play a vital role in teaching and learning, especially in a student-centred environment. They are responsible for designing their lessons, enriching them with external elements such as using technology and gamification and then following up with the development and the pace during the class. Teachers support and help students by motivating



them to acquire new knowledge and finish their tasks on time. However, the teachers' job might become more challenging in online classes because of several other factors like communication and technical issues. Therefore, there is an ongoing discussion about the best practices to motivate students, especially in online environments. Also, the number of studies looking at motivation in online learning environments has dramatically increased during the last decade (Esra and Sevilen, 2021). This reflects the importance of this kind of studies as they focus on what I believe is the future of teaching and learning; therefore, HE teachers need to prepare themselves for the future and develop different strategies to improve the online teaching experience of their students. These new techniques and strategies need to be based on the teachers' deep understanding of online pedagogy and technology (TWT) as well as understanding the source of students' motivation.

### **3. Motivation Issues in HE Online Classes**

Several studies have been conducted on the use of online platforms in higher education, especially during the pandemic (Aguilera-Hermida, 2020; Gustiani, 2020; Hysaj and Hamam, 2020). These studies reveal that several issues can be encountered during online classes. One of these vital issues could be the issue of motivation. With all the social isolation imposed by the nature of online classes (especially during the pandemic) and the new pedagogy used, students might become demotivated to participate or engage in the discussion. Although students have positive attitudes toward online group work (Hysaj, Hamam, and Baroudi, 2021), sometimes, students can be demotivated to work with their colleagues on their projects. This lack of motivation might lead to severe consequences when discussing students' comprehension and development. Once a student is demotivated to participate in the online class, they will cease to acquire new knowledge and will not be able to practise anymore. So basically, the students' low motivation levels negatively impact the teaching and learning process. While HE classes encourage the learners to be autonomous and self-directed, the lack of motivation can cause the exact opposite to occur. Students become uninterested in the subject they are studying and blame the teacher for its level of difficulty and complexity if any. They become more dependent on the teacher and stop working independently. Therefore, several issues that involve motivation have emerged in online classes. Esra and Sevilen (2021) stated that students had negative perceptions and a lack of motivation in online classes mainly because of the lack of social interactions with their peers and their teacher.

On the other hand, Gustiani (2020) discovered that students' intrinsic motivation was led by their need to acquire new knowledge and the fact that they wanted to enjoy the new teaching method after shifting to online classes during the pandemic. The extrinsic motivation comes from external regulation. But Gustiani (2020) also mentioned that the lack of motivation occurred because of the lack of supporting facilities. Also, Elshareif and Mohamed (2021) researched the association between the main aspects of eLearning and students' motivation. Students appeared to be more motivated in the assessment-related activities but were less motivated when it came to group discussions and feedback. Moreover, several studies showed that students' motivation decreased in online classes because of technical difficulties or the lack of social interactions, in addition to the absence of eye-to-eye connection, along with other reasons (Aguilera-Hermida, 2020; Agustina and Cheng, 2020; Esra and Sevilen, 2021; Hysaj and Hamam, 2020).

## Methods

The study utilized mixed methods for data collection; therefore, qualitative and quantitative data were collected. First, for the qualitative data, the researcher organized a focus group with six experienced higher education (HE) teachers from several HE institutions to discuss students' motivation and the best practices they found to motivate their students in online or remote classes. Then, the reasons behind students' motivation and the best practices emerging from the focus group were thematically divided. Second, for the quantitative data, the researcher designed a survey to explore the students' views about their source of motivation in online classes. The survey included 12 Likert scale items, and it was based on the themes identified through the focus group discussions. The survey was advertised through social media platforms and targeted undergraduates who came from different majors and studied online in several higher education institutions. The age group of the participants was 19-24, with a median of 21.5 years old. The participants had to give their consent at the beginning of the survey to participate in the research and were assured confidentiality and anonymity of data. A sample of 344 students responded to the survey, and the results were analyzed using computer software. The extracted results from the focus group and the survey are presented in the next section.

## Results

The results were extracted from two sources: qualitative data from the teachers' focus group and quantitative data from the students' survey. For the first source, three teachers believed that it is entirely a teacher's job to motivate students. One teacher explained that if enough effort is made in designing the lesson, this will contribute to the increase in students' motivation. Most teachers believe that the students should have their internal motivation since they are college students and they are supposed to know what they are doing. Another teacher mentioned that students' motivation could be increased if teachers encourage student-centered learning in their instructional methodology. Four out of the six teachers confirmed that a feeling of isolation and the lack of interaction between the students and their peers, and the students and their teachers, are the main reasons for the students' lack of motivation. Teachers suggested using different strategies to increase the students' motivation, such as using interactive platforms, turning the camera on during class, designing group work and collaboration activities, creating quizzes and challenges, in addition to asking the students to prepare parts of the lessons and explain them to their peers. According to the teachers, more strategies that seem to work are creating a reward system, setting clear goals for each lesson, taking short breaks during the online session, encouraging the students to work together even outside class time, designing interactive and interesting lessons, as well as using technology and gamification.

For the second source of data, the students' survey, the results revealed the percentage of each survey item based on the students' responses. The survey was designed using a 5-point Likert scale with the following options: (1=Always, 2=Often, 3=Sometimes, 4=Rarely, 5=Never). The survey items were based on the focus group results and the themes identified. The findings indicate that most students are aware of the reasons behind their motivation in online classes, with 75% choosing "Always" and 21% choosing "Often". The results also showed that students believe that they should have intrinsic motivation to participate and engage in the online classes, with 73% choosing "Always" and 15% choosing "Often". When the students were asked whether their teacher is responsible for their motivation, 51% chose "Always". Also, students believed the teacher's teaching style could improve their

motivation level in the online class, with 69% choosing “Always” and 18% choosing “Often”. However, students indicated that some actions or practices in the online classroom might lead to their lack of motivation. For example, the majority of students (53% of students chose “Always” and 41% chose “Often”) mentioned that they would lose their interest if the class is boring, while 19% of students chose “Rarely” and 35% chose “Never” which indicates that their motivation is not very much affected if the teacher is demanding or gives many tasks. Students also mentioned (43% of students chose “Always” and 26% chose “Often”) that they might lose motivation if the topic is not useful or interesting, and 44% of students chose “Always” and 35% chose “Often” when asked if they might lose their motivation if the teacher is too critical or very strict. Finally, 35% of students chose “Rarely”, and 45% chose “Never” which indicated that their motivation might be affected by other external factors like family issues or internet connection. For the last survey item, students showed that factors like using technology, mobile learning and games in class might increase their motivation, with 57% who chose “Always”, and 35% who chose “Often”.

## Discussion

The study's main findings indicate that HE students are aware of the source of their intrinsic motivation. However, they believe that the role of their teachers is crucial in motivating or demotivating them in online classes. This finding concurs with the findings of Anderman, Andrzejewski, and Allen (2011), who stated that teachers played an important role in motivating their students through their teaching practice, and with the findings of Liu (2010), who mentioned that teachers were able to increase the students’ motivation through class activities, as well as the findings of De Naeghel, et al. (2014) who also emphasized the importance of the teachers’ role in increasing their students’ motivation. The findings also show that the quality of the lesson and its pace might have an impact on the students’ level of motivation and this finding agrees with the Chan and Ahern (1999), who stated that instructional design and the fact that lessons are not complex or distracting play an essential role in motivating students. This finding also agrees with Könings, Brand- Gruwel, and van Merriënboer (2011), who found relationships between the students’ perceptions and preferences about the lesson and their level of motivation. Although students indicated that they are aware that they need to have their own intrinsic motivation, they also explained that their teachers’ attitudes and how they deliver the class might increase or decrease their motivation. Students also revealed that they were more interested in the lesson and motivated when it was technology-based or when it included mobile learning or games. This finding agrees with Estapa and Nadolny (2015), who found that the use of technology (augmented reality) motivated students in mathematics classes, and the findings of Purba, et al. (2019), who stated that using games like the Kahoot game increased the students’ learning motivation in the classroom, and the findings of Divjak and Tomić (2011), who discovered that the use of games increased students’ motivation. However, this finding disagrees with Huizenga et al. (2009), who stated that there was no difference in the students’ motivation level after using mobile learning in class. The results also showed a marginal impact of other factors such as the teachers’ attitude towards the lesson, if there are many tasks, and the nature of the topic being delivered in the online class. Also, a small percentage of students believed that other external factors like family issues or internet connection might impact their motivation in the online classroom.

## Conclusion

To conclude, this paper looked at both the intrinsic and the extrinsic motivation for HE

students in online or remote learning environments, and it also discussed the best strategies employed by experienced HE teachers to motivate their students. Knowing that motivation is an integral part of teaching and learning, it is crucial and vital for HE teachers to understand the reasons for their students' motivation and know the best strategies to increase their motivation, especially in online classrooms, as such classes have a unique nature. The findings revealed that several factors might affect the students' intrinsic and extrinsic motivation levels, such as their need for the course or the teachers' way of instruction. The study also revealed the best strategies found by HE teachers to increase their students' motivation. These strategies include but are not limited to online collaboration, technology utilization and gamification, as well as other strategies. The findings of this study should offer contributions to the professional development programs of HE teachers, which should lead to improvements in the teaching and learning process, especially in online classrooms.

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## ***What Kind of Consolation Do Students in Japan Who Have Seriously Failed Academically Really Want?***

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### **Abstract**

Failure is inevitable for students. The serious failures for students in Japanese schools are failure to pass exams and late submission deadline. How students are comforted in such failures may affect their recovery and motivation for further study. Since friends, instead of teachers, are the significant others in adolescence, we examined the effectiveness of eight types of comforting strategies from friends (including empathy, advice, presentation of the friend's own failure, physical contact, and offer of assistance at the pace of the student, etc.). Participants were 153 female university students. Questionnaire. The results showed that in the two situations a more effective way of comforting was to include an offer of help, taking into consideration the pace of recovery at which the student was able to receive the comfort, rather than to include advice (Main effects of comforting strategies; Exam scene  $F(7,2128) = 31.89, p < .01$ , task scene  $F(7,2128) = 16.81, p < .01$ ). Consolation with advice was difficult to accept, especially in the failed exam scene. Next, we analyzed the effect of the difference in psychological distance from friends on comforting. It was suggested that, depending on the difference in psychological distance from friends, there were some ways of comforting that were ineffective even when comforted by friends who were with them on a daily basis (Exam scene  $F(1,151) = 18.48, p < .01$ , Task scene  $F(1,151) = 10.42, p < .01$ ). We will discuss different effective ways of consolation from friends that empower students who have experienced painful failures.

Keyword : Consolation, Academic Failure Situations, Psychological Distance, College Students, Friends

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## Introduction

Failure is inevitable for students. The serious failures for students in Japanese schools are failure to pass exams and late submission deadline. Failure to pass exams or miss submission deadlines is a serious problem for students, especially in Japanese schools. How students are consoled for these academic failures may affect their recovery and subsequent motivation to learn. People offer comfort to others who are depressed or anxious in the face of negative events. Comfort is one of emotional support. It is defined as Verbal and nonverbal actions taken to reduce the discomfort and restore the psychological state of an individual when he or she is experiencing some difficulty(Ogawa,2014,p.279).

During adolescence, when adolescents are striving for psychological independence from their parents and friends become important others, consolation from friends in situations of academic failure is considered to be an important psychological support. There are many different types of consolation. Verbal consolation, such as accepting and encouraging the feelings of a person suffering from stress through words, and nonverbal consolation, such as tapping a person on the shoulder or shedding tears together with the person (Ogawa&Nakazawa,2014,p.61). Comfort has also been shown to relieve depression and increase the recipient's sense of security and happy mood (Bylsma, Vingerhoets, & Rottenberg, 2008), and may play a significant role in recovering from negative situations.

Consolation, however, does not always have a positive impact on the recipient. The reason for this is thought to lie in the motivation for consolation. Comfort is primarily motivated by the feeling of "pity," which is an emotion that directs sympathy and concern toward the other person by feeling "poor" or "sorry" for the other person's predicament. Therefore, it has also been shown that when the recipient of comfort feels that the other person is feeling sorry for him or her, he or she recognizes the difference between the other person's ability and position, which has a negative effect on self-esteem and increases depressive feelings (Blaine, Crocker, & Major, 1995). Thus, while comfort is expected to have a positive impact, it can also have a negative impact on the recipient. Therefore, a detailed examination of how to console a friend who has experienced academic failure is warranted.

However, the difficulty of this examination reveals that in contemporary friendships in Japan, even when a friend is depressed, there are cases in which the friend remains unable to do anything to comfort the friend, fearing that consolation will hurt the friend (Mitsuno & Miura, 2010). This suggests that there may be hesitation among friendships, such as not knowing what to say to a friend who is in a negative situation. In contrast, a study by Ogawa and Nakazawa (2014) showed that the percentage of respondents who answered "yes" was significantly higher than that of those who answered "no" to the question, "When you have a hard time and feel depressed, would you want a friend to comfort you? This suggests that the recipient of consolation in a negative situation wants to be consoled by a friend, but the consoler is too concerned about the negative effects of consolation to do anything about it, suggesting that there may be a difference between the recipient and the sender of consolation.

In a previous study on consolation, Ogawa (2011) examined the effect of closeness to the other person on the recipient of consolation, examining differences in the recipient's emotions when consoled during a stressful event, depending on the closeness of the consoler to the person being consoled. The results showed that consolation from a close friend led to higher feelings of pleasure (e.g., happiness, relief) and lower feelings of repulsion (anger and irritation toward the recipient) than consolation from a person one did not know well. This



previous study has shown that consolation from a close stranger is easier to accept than consolation from a less close stranger. It is also thought that the closeness of the consoling partner influences the acceptance of consolation. However, even close others differ in their psychological distance from that person. It is conceivable that even a close friend with whom one is often together on a daily basis may not be able to accept consolation from that friend if the psychological distance is not very close.

Based on the above, this study focuses on the recipients of consolation among college students to examine (1) what kind of consolation they can accept in academic failure situations, and (2) the relationship between psychological distance from friends and the acceptance of consolation. Regarding consoling behavior, which has also been suggested to have a negative impact on the recipients of consolation, we believe that examining and clarifying consolations that are easily accepted by the recipients of consolation will be one way to support the development of good interpersonal relationships in daily life.

### **Method of investigation**

The survey methodology, divided into preliminary and main investigation, is described below.

#### **Preliminary investigation**

Thirty-eight university students (6 males and 32 females, mean age 19.79) were included in the analysis.

In order to investigate what kind of serious negative situations are for college students and to establish the negative situations in this study, Takabira's (1998) Life Event Scale by Interpersonal and Achievement Domain was used to conduct the survey. For each of the 19 scenes in the achievement domain in the negative items of the life event scale by interpersonal and achievement domain, a rating of the negative severity of each scene was obtained using a 10-point scale (1 = "Not a negative event at all" to 10 = "A very negative event").

The mean and standard deviation of the negative severity of the 19 scenes were then calculated (Table 1). Based on the results, the following two situations were selected as academic failure situations that had the highest negative severity for the students.

A1. Assignments were not completed by the due date" (average 8.18) and "A2. Failure in anything related to the examination" (average 7.89).

Negative life events (achievement area)	Average	Standard deviation
1. I did not complete assignments (e.g., reports) by the due date.	8.18	1.96
2. I experienced frustration with things related to my entrance examinations.	7.89	2.13
3. I had many assignments (reports, etc.) that I had to do.	7.82	1.77
4. I did not make good progress in my studies, research, or graduation.	7.71	1.80
5. I got bad grades in exams and reports.	7.61	2.30
6. I was fired from my job (part-time job).	7.53	2.20
7. I started taking classes where the assignments (exams, reports, etc.) were very difficult.	7.34	1.83
8. I had to spend time on something unrelated to my ongoing work (study).	6.97	1.87
9. My hobbies and lessons did not improve as much as I would have liked.	6.97	2.02
10. I became dissatisfied with my current university.	6.82	2.51
11. I could not keep up with my classes.	6.79	2.36
12. I lost interest in the field of research that I am currently majoring in (or planning to major in).	6.74	2.48
13. I could not find a job (part-time job).	6.74	2.11
14. I could not get the job (part-time job) I wanted.	6.68	1.99
15. I was not satisfied with the performance of my assignments (reports, presentations, etc.).	6.61	1.91
16. I spent time on useless things.	6.29	2.49
17. I started taking classes that I was not interested in.	6.26	2.50
18. I could hardly answer the teacher's questions in class.	6.24	2.38
19. I quit my lessons or hobbies.	4.45	2.32

Table1 Mean and standard deviation of severity for each negative life event

## Main investigation

A total of 203 university students (53 males and 153 females, mean age 18.95) were included in the analysis.

The negative situations specifically presented in this study were the "A1. Assignments were not completed by the due date" and "A2. Failure in anything related to the examination" situations selected by the preliminary survey. The eight types of consolations (B1-B8) were based on Nakano and Shobo (2011) 6 types plus Ogawa and Nakazawa (2014) 2 types (Table 2).

The participants were asked to rate the degree to which they could accept 8 types of consolation from their friends in 2 academic failure situations using a 5-point scale (1 = "not at all acceptable" to 5 = "very acceptable").

Kaneko's (1989) psychological distance scale was used to measure psychological distance from others. This scale was constructed based on research on parent-child and friend relationships, loneliness, and alienation. In this study, participants were asked to recall one friend with whom they spend most of their time, and were asked to rate 10 items such as "I trust my friend" on a 5-point scale (1 = not at all true, to 5 = very true). The average score of the 10 items is considered to be the person's psychological distance from his/her friends, and is used in the analysis. The sufficient discriminative power and equality of the psychological distance scale were confirmed by Kaneko (1998).

B1	Words of sympathy and admission. I'm sorry you had to go through that. That's hard ."
B2	Reassure them to look around them words that present a point of view. I've had that happen to me, too."
B3	Words of advice that serve as comments and objective advice. You should do that."
B4	Words of encouragement to encourage others. Let's go for it!"
B5	Offer of assistance at the pace of the student. Let me know if there's anything I can do." If it's okay with me, I'll listen."
B6	Change the subject or make a joke.
B7	Indirect encouragement. Talk to them more than usual. Take them somewhere to change their mood, etc.
B8	Physical contact. Tapping on the shoulder, hugging.

Table 2: 8 categories of consolation

## Results and Discussion

The results and discussion of this study are presented below in three major sections.

### Gender differences in acceptance of comfort from friends in failure situations.

Initially, a comparison of the gender differences in the mean scores for the acceptance of eight types of comforting methods was conducted to see if there were any differences between the data of male and female subjects analyzed in this study. The results showed that women were less likely than men to accept consolation in the "B3: Advice" and "B6: Change the subject or make a joke" consolation methods (B3 advice:  $t(204) = 2.94, p < .01$ ; B6 change the topic/joke:  $t(204) = 4.18, p < .01$ ). From this, it was inferred that there were differences in the acceptance of comfort between men and women, and that women may have more difficulty accepting some types of comfort than men. Therefore, in subsequent analyses, we decided to focus on women as the subjects of analysis, rather than combining data from men and women.

### Types of consolation that women can and cannot accept from friends in academic failure situations.

A two-factor analysis of variance was conducted on the consolation accepted from friends in two academic failure situations: 2 situations  $\times$  8 consolation methods. The results showed that the main effect of scene was significant ( $F(1,152) = 6.027, p < .05$ ), and A1: task failure scene was significantly more likely to accept consolation than A2: exam failure scene.

The main effect of consolation ( $F(7,1064) = 25.665, p < .01$ ) was significant, so a subtest was performed. As a result, the most and least acceptable consolations in the two academic failure situations were as follows. In all situations, the consolation that was most acceptable was consolation using B5's words of assistance that matched the other person's pace, such as "Please let me know if there is anything I can do" and "I will listen to you if it is okay with me" ( $B5 > B1, B3, B4, B6, B7, B8$ , all  $p < .05$ ). This suggests that when consoling a friend who has failed academically, B5's words are more effective than B4's direct words of consolation, such as "do your best," or B3's advice, such as "you should do better," as they are more in tune with the other person's feelings and pace, and wait until the person feels like talking.

Conversely, the consolations that showed a common tendency to be difficult to accept were those using B6 to change the topic or make a joke ( $B6 < B1, B2, B3, B4, B5, B7$ , all  $p < .05$ ). This suggests that when a friend is in an academic failure situation, the consolation of making a joke of B6 and cheerfully laughing it off is not so much sought after, but consolation that is attuned to the sadness and pain of the consolation receiver.

Furthermore, the interaction between academic failure situations and type of consolation was significant ( $F(7,1064) = 21.344, p < .01$ , see Table 3) and was subtested.

Average score of acceptance			
Types of consolation	A1.Task scene	A2.Exam scene	
B1. Sympathy and acknowledgement	3.43	3.42	
B2. Perspective presentation	3.89	3.44	**
B3. Advice	3.51	2.71	**
B4. Encouragement	3.68	3.28	**
B5. Assistance	3.92	3.59	**
B6. Change the subject or make a joke	2.75	2.72	
B7. Indirect encouragement	3.03	3.50	**
B8. Physical contact	2.73	3.10	**

\*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$

Table 3: Degree of acceptance of different methods of consolation in 2 situations of academic failure.

The results of multiple comparisons using the Holm method showed that the degree of acceptance varied from scene to scene, especially for B3's "you should do ~" comment and comforting words of advice that served as objective advice. That is, they were less likely to accept the A2 exam failure scene, but more likely to accept the A1 task failure scene (A1 task scene: mean 3.510, A2 exam scene: mean 2.716,  $p < .01$ ). From this, it can be inferred that words of advice are less likely to be accepted in examination failure situations where it is difficult to recover instantly and the next time is not immediately foreseeable.

B4 words of encouragement, such as "keep up the good work," tended to be accepted more readily in the two academic failure scenarios. In particular, they were even more likely to be accepted in the task failure situation than in the examination failure situation. In a situation such as the assignment failure situation, where the next chance comes quickly, the receiver's desire to do his/her best and the giver's encouragement to do his/her best are likely to coincide, making it easier to accept the words of encouragement. On the other hand, it was

clear that comfort through physical contact, such as a tap on the shoulder or a hug, was less acceptable than other forms of comfort in task failure situations.

### **Association between psychological distance and comfort acceptance in women.**

We considered that even friends who are often together on a daily basis may not be able to accept consolation depending on the psychological distance between them. Among the 153 subjects analyzed, those who scored between 1.00 and 2.20 were divided into the close psychological distance group (84 subjects) and those who scored between 2.30 and 5.00 into the far psychological distance group (69 subjects) based on the overall mean psychological distance score (2.20). Then, a two-factor analysis of variance of psychological distance (near/far)  $\times$  type of consolation (8 types) was conducted for each negative situation. The results showed that in both of the two academic failure scenes, consolation from the far psychological distance group was significantly less acceptable than consolation from the near group (examination scene  $F(1,151) = 18.48, p < .01$ ; task scene  $F(1,151) = 10.42, p < .01$ ). These results indicate that even friends who are often together on a daily basis are less likely to accept consolation from friends who are psychologically distant from them than from those who are psychologically closer to them. It is thought that psychological distance from the other person is more important than time spent together in accepting consolation from the other person in academic failure situations.

The interaction between psychological distance (near/far) and type of consolation was significant in situations where the task was not completed ( $F(7,1057) = 2.72, p < .05$ ). The results of the subtests showed that the consolation received from the far psychological distance group was significantly less acceptable than from the close group in the B1 sympathy and acknowledgement, B2 perspective presentation and B3 advice approaches (sympathy and acknowledgement,  $F(1,1208) = 13.06, p < .01$ ; perspective presentation,  $F(1,1208) = 15.59, p < .01$ ; advice,  $F(1,1208) = 9.10, p < .01$ ). On the other hand, there was no effect of psychological distance on other types of consolation. This suggests that the effects of psychological distance and type of comfort on consolation acceptance are not uniform.

### **Conclusions**

The present study revealed consolations that are easy to accept from friends and conversely, consolations that are difficult to accept. We feel that the specific clarification of consoling behavior, which has also been suggested to have a negative impact on the receiver, may support the development of good interpersonal relationships in daily life. Since this study focused on "academic failure situations" among the negative situations, we believe it is necessary to examine the acceptance of consolation in various situations, not limited to academic failure situations, in future studies.

In addition, in the examination of the combination of psychological distance and the type of consolation, it became clear that the psychological distance from the partner is more important than the time spent together in order to accept consolation from the partner in the academic failure situation. This suggests that when providing consolation, it is necessary to consider the psychological closeness between oneself and the other party while choosing consolation that the other party is likely to accept or consolation that is not affected by the psychological closeness if the psychological closeness is felt to be too far away from the other party.

In future research, we feel that it is necessary to set up the type of situation in which the consoling party is placed. Furthermore, more qualitative research is needed in the future, such as moving to interviews and examining the influence of past experiences on the acceptance of consolation.

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***Combined GIS Based Spatial-Temporal Analysis Using Social Media Data of  
Wuhan, China***

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**Abstract**

The development and growth of Internet technology with geo-location has promoted the development of China's Volunteered Geographical Information (VGI) Services. Twitter-like Sina Weibo has gathered a large number of user check-in data, which contains the geolocation features with temporal information. Weibo data has become a major source of geographic location information, helping to access human to service facilities, social events, disaster activities, and real-estate business. This study selects Wuhan (capital of Hubei province) as the study area and combines the collected micro-blog data (2012-2017), POI data (Hubei Surveying and Mapping Bureau) and OSM road network dataset with remote sensing image data. Through spatial inclusion statistical analysis and Change Detection techniques, time and space of Weibo visit frequency and its influence in major universities and commercial pedestrian streets in Wuhan were carried out. This paper will use the clustering algorithm (K-Means), query analysis technique and density analysis method to generate a time-space density cloud of microblog data for institutes and pedestrian streets to find the socio-economical sites within streets and universities, which is beneficial for real-estate business. Both spatial and statistical analysis indicates that the Wuhan University is the university with the highest number of user's favorite, commentary and content published. All these trend analyses verified through K-mean clustering and change detection techniques to find changes in human mobility patterns of crowds in Wuhan's well-known streets and universities using Google Earth's high-resolution optical imagery. The peak-to-valley analysis of Weibo data reveals past hot events held in Wuhan.

Keywords: VGI, Sina Weibo, Spatio-Temporal, Point of Interest (POI), Open Street Map (OSM), Change Detection, K-Means

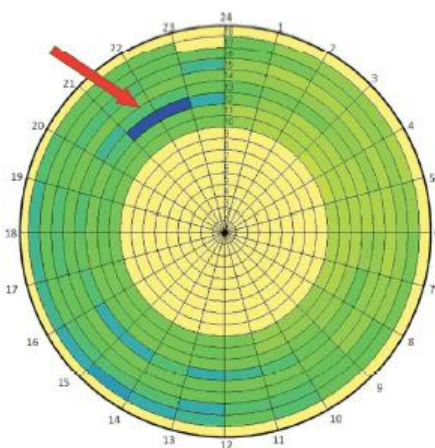
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## INTRODUCTION

With the immense growth and expansion of micro-blog services in China, the growth of Sina Weibo users are increasing with the passage of time. Social media is progressively found in the daily routines of ordinary people in China. The impact of social media is now growing faster and has become an important unseparated part of peoples' life. With increasing the advancements on the Internet especially on Weibo the mobile phone technology made access to the internet in mobile phones from any location spatially and temporally which can enhance the transmission of online information about different events. Social network analysis uses innovative mathematical methods and statistical analysis to study the associations among users [1]. Social Media (geo-location) data regularly called "check-ins", about their existence in specific location or venues at given times [2] can be utilized for describing some spatial-temporal consistency in urban areas such as identifying, new buildups and commercial centers [3], detecting local events [4] and determining population distribution [5].

In present, with the expansion of social networks and communication advancements and the popularization of mobile stations, each single user plays the role of a sensor, which in result shows rise in the amount of User-Generated Content (UGC) data (e.g., social media data) to be made obtainable, as well as Volunteer Geographical Information (VGI) [6].



**Figure 1:** Data Clock indicating tweet quantity data in one month per hour.  
(Stefanidis et al. 2012)

A combination of spatial-temporal information gained from social media, public views, outlooks on a hazard extracted from social media and its importance on foreign policy and culture broadcast into an academic area and research can assist government policy-making and help people better recognize the state [7] [8].

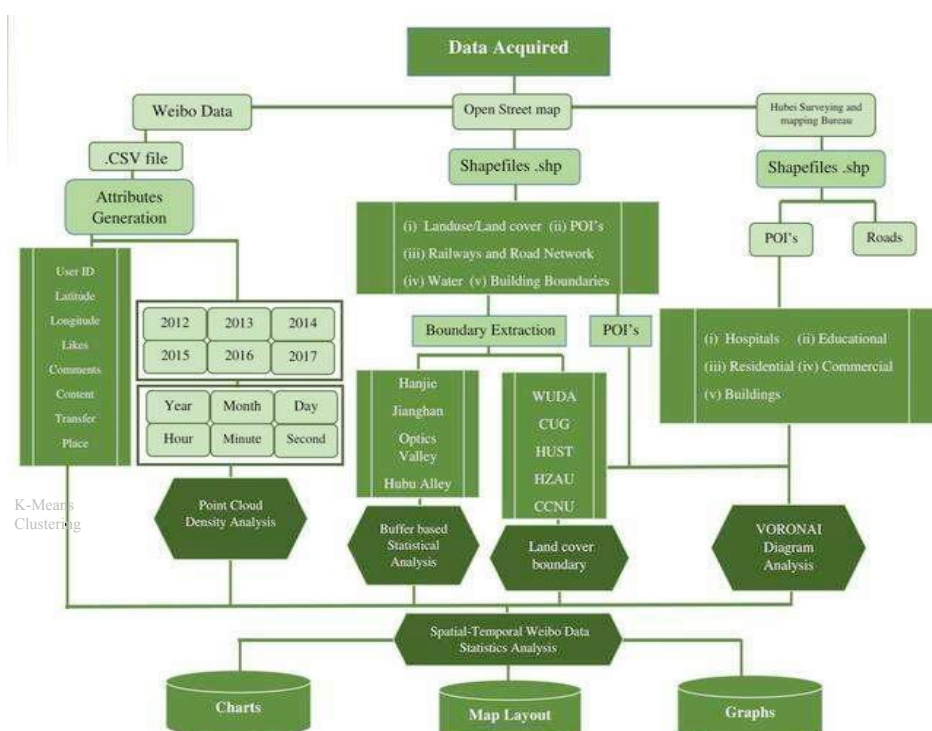
### Characteristics and Significance: Social Media Weibo

Among the Web 2.0 applications, a micro-blog (Weibo in Chinese), a Twitter-like social media has gained substantial popularity in China. This research project will respond to those quantitative questions, collecting the spatial-temporal based social media data from Sina Weibo with containing the textual geographical information, with the help of visual data and statistical analysis to reveal interesting spatial patterns, unusual events, and trends through

various visualization systems [9]. As shown in Fig. 1 the spatial patterns of check-ins using Weibo based on different characteristics like dining, work, home, etc.

## Research Schema and Flow

The research methodology was designed starting with determining the study area and target virtual community. Since Weibo is the most popular microblog platform in China and this study collected Weibo datasets as a study platform. For this research, essentially Weibo dataset is utilized to understand the content published on social media through spatial-temporal analysis at different times. As the major area is taken of Wuhan which is the capital of the Hubei province of China and the processing of data is shown in *Figure 2*.

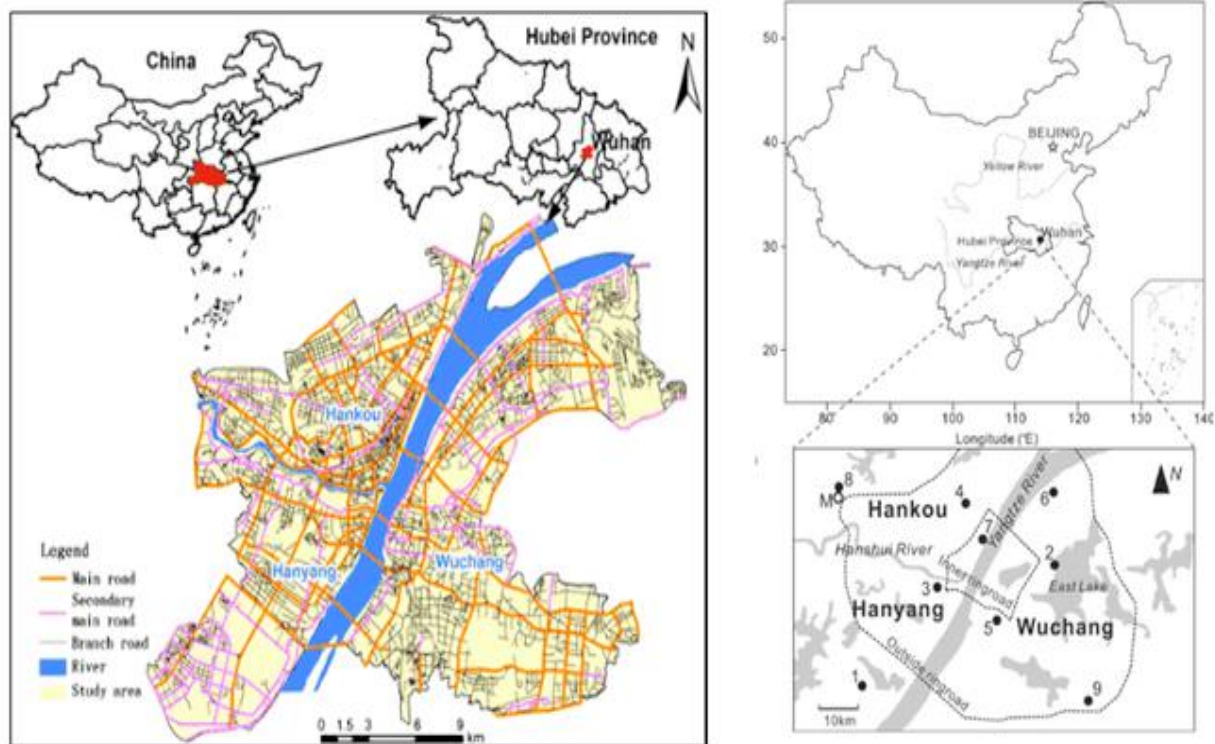


**Figure 2:** Structure and Working Flow Chart

The Weibo based analysis was obtained using the different application programming interfaces from 2012 to 2017. After removing redundancy and invalid data, we obtained more than 404454 records in the form of database including the data which published at different places, amounts of content, comment, and likes on different times and dates.

## Overview of study area

Wuhan (29°58′–31°22′N, 113°41′–115°05′E), the capital of Hubei Province which is most populous city in Central China and one of the nine National Central Cities of China. It is crossed by the Yangtze River which is known as the longest river in China as shown in *Figure 3*. Wuhan lies on the East of the Jiang-Han plain, a huge area alongside the Yangtze River. Wuhan's subtropical moist monsoon climate contains four distinct seasons [10]. It is a major transportation hub, with dozens of railways, roads, and expressways passing through the city and connecting to other major cities.



**Figure 3:** Wuhan Study area, Geography and Location

The urban people living density comes to almost  $1,200/\text{km}^2$  or  $3,200 \text{ sq mi}$ . Most of the area is plain and decorated with hills and a great number of beautiful universities in which some of the famous universities are taken under study as shown in *Figure 4 (a)*. Besides of lakes and ponds Wuhan is also the hub of transportation due to Yangtze river and contains plenty of shopping streets where most famous commercial streets were chosen for study which are shown in *Figure 4 (b)*.



**Figure 4:** (a) Famous Universities of Wuhan, Middle: Wuhan University (WHU), Top left: Central China Normal University (CCNU), Top right: China University of Geoscience (CUG), Bottom left: Huazhong Agricultural University (HZAU), Bottom right: Huazhong University of Science and Technology (HUST).  
(b) Famous Commercial Streets of Wuhan



Considering the physical features of Wuhan, which contains the scenic hills and the beautiful East Lake, Ponds and lush green trees. Wuhan University is recognized as one of the most beautiful and attractive universities in China, particularly for its cherry blossom garden as shown in the center of *Figure 4 (a)*. This campus is occupied by dense and green trees, the view of East Lake and Luojia Hill with sweet-scented flowers everywhere whole year.

## **Data Acquisition and Processing**

### *1. Time Series Sina Weibo Data (2012-2017)*

In July 2010, Weibo open platform was formally announced and open to the public. Weibo open platform is an information subscription and platform, providing assistance and communication channels with a huge amount of data and Weibo is the most popular microblog platform in China and is dominated by Chinese language users as explained by Louis et al. (2011).

### *2. Hubei Surveying and Mapping Bureau POI Data*

The Point of Interest data downloaded from 湖北测绘局 Hubei Surveying and Mapping Bureau Geolocation data which is utilized with Open Street Map road-network data to analyze maps and graphs concerning time and place.

### *3. Open Street Map*

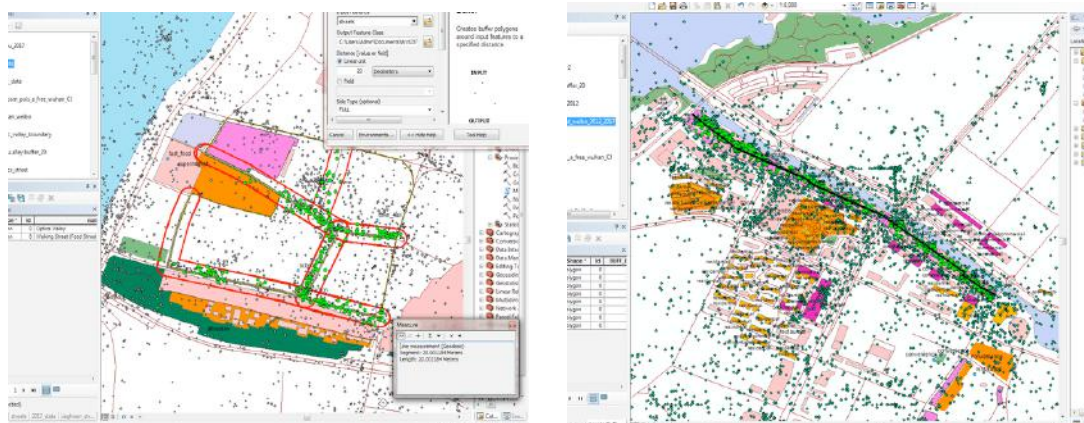
Open Street Map is a massive database of geographic data, and it's all open and free. OSM is reflected as a prominent example of volunteered geographic information. On Open Street Map, the content of spatial data is created and controlled by users themselves.

## **PROPOSED METHODS**

In ArcMap workspace, the shapefiles were taken of the following data including the Weibo point data of different times from 2012 to 2017 with attributable properties for example content, like, comment and times of publishing data on social media. The OSM data is also utilized containing corresponding features like the roads, water bodies railways, POI's (Point of interest), boundary data, land use with different subclasses (forest, residential commercial area, universities, schools, buildings).

### **1. Buffer Proximity of Streets Boundary: Statistical Analysis**

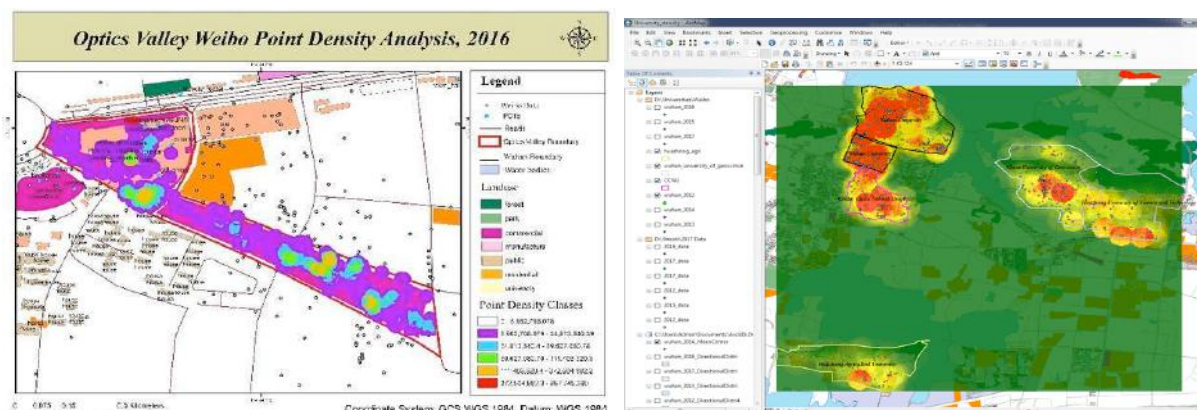
In ArcMap, buffer tool analysis applied in a range which created polygons around input features to a specified distance so that it must cover the area of streets containing commercial markets, shops, and other related POIs. In *Figure 5* the selected Green color points indicate the Weibo data taken for all streets and features are clipped using the clip tool. Attribute-based queries are applied for the yearly based like and comment Weibo data analysis.



**Figure 5.** Streets Boundaries containing Weibo data Left: Buffered Zone of Hubu Alley 20m, Right: Boundary of Han Street (OSM)

## 2. Spatial-Temporal Changes & Trend Mining of Universities & Business Streets with Cloud Density analysis

After taking the boundary around each university and pedestrian streets using buffer proximity and OSM boundary data, the spatial-temporal changes were detected from 2012-2017 through heat map layouts and density algorithms. *Figure 6* show the Density Cloud map using Nearest Neighbour and Natural Breaks and stretched from high to low values to heist values and class values density map of the street. Weibo data of each university and street give us the information about the content published which show the most visited, favourite, and commentary sites within the study area.



**Figure 6:** Density Cloud map using Nearest Neighbor and Natural Breaks

### 3. MATLAB K-Means Clustering Algorithm

The clustering of point data of Weibo (2012-2017) is acquired by using MATLAB and applied K-Means algorithm. The point density cloud showing the high to low dense regions are formed by using python on ArcMap.

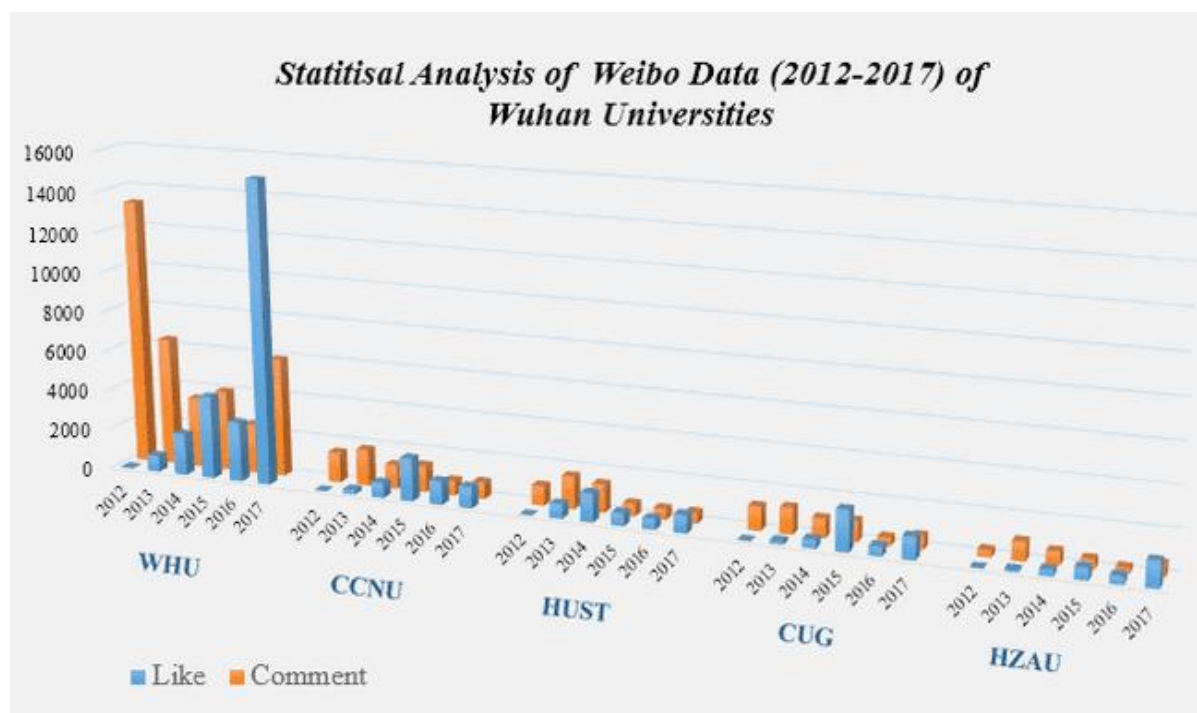
## RESULTS AND DISCUSSION

### Statistical Analysis

#### 1.1 Results of Universities

Moreover, besides the text, there are various types to represent the data in the form of hierarchy and graphs. For any social media data like Sina Weibo, the user's activity could be seen as individual dots or peaks, and the relationship between the two parameters for example like and comment data for 2012-2017 could be seen as in the form of Map layout, bar chart, and table. From 2012-2017 the peak of comments and likes received for Wuhan University is greater say for comments the peak is 13244-5990 and for likes is 36-14235.

The peaks in the bar chart in *Figure 7* clearly show Likes, Comments on content published on Weibo and from 2012-2017 the maximum peak is shown by Wuhan University comparative to other universities



**Figure 7:** Universities with frequently published on Weibo from 2012-17. The abbreviations are; Wuhan University (**WHU**), Central China Normal University (**CCNU**), Huazhong University of Science and Technology (**HUST**), China University of Geoscience (**CUG**) and Huazhong Agriculture University (**HZAU**)

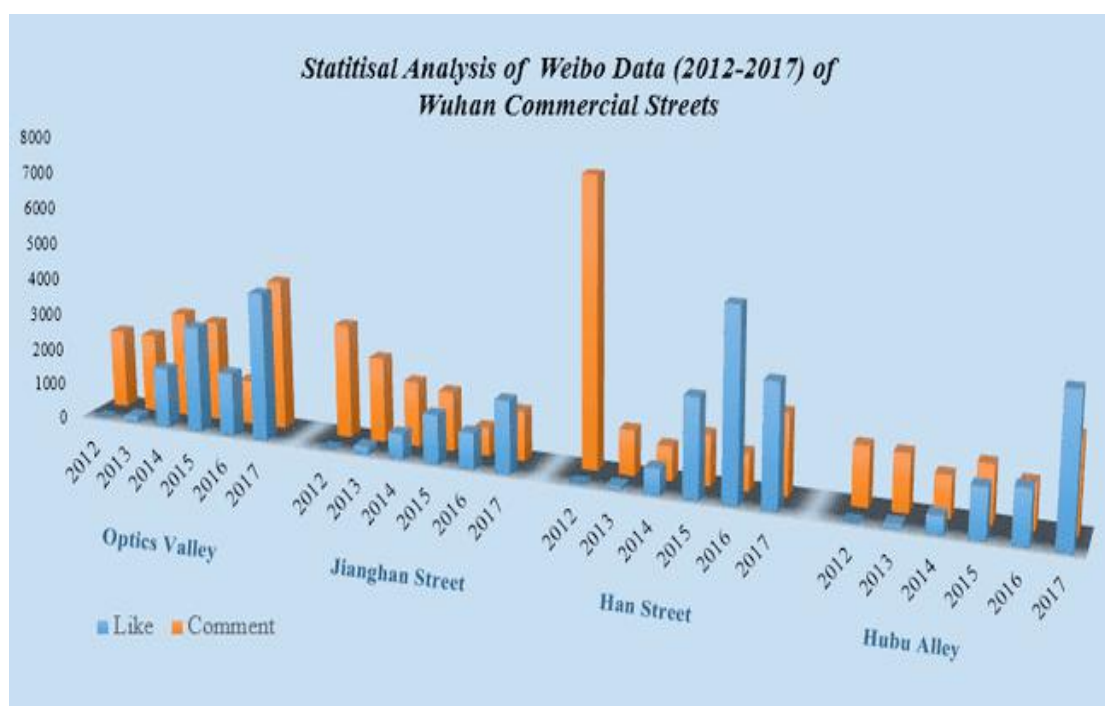
The statistical results suggest that WHU is the most favorite, commentary and content published university within Wuhan depending on its ancient architecture and people visits as shown in **Table 1**. The short forms are used for all 5 universities which are taken under study which are; Wuhan University (**WHU**), Central China Normal University (**CCNU**), Huazhong University of Science and Technology (**HUST**), China University of Geoscience (**CUG**) and Huazhong Agriculture University (**HZAU**).

**Table 1:** Universities of Wuhan with frequently published Like “L” and Comments “C” Data on Weibo from 2012 to 2017.

2012	2013	2014	2015	2016	2017
1)WHU <sup>(L,C)</sup>	1)WHU <sup>(L,C)</sup>	1) WHU <sup>(L,C)</sup>	1)WHU <sup>(L,C)</sup>	1) WHU <sup>(L,C)</sup>	1) WHU <sup>(L,C)</sup>
2)CCNU <sup>(L,C)</sup>	2)HUST <sup>(L)</sup> CCNU <sup>(C)</sup>	2) HUST <sup>(L,C)</sup>	2) CCNU <sup>(L,C)</sup>	2) CCNU <sup>(L,C)</sup>	2) CCNU <sup>(L,C)</sup>
3)CUG <sup>(L,C)</sup>	3)CCNU <sup>(L)</sup> HUST <sup>(C)</sup>	3) CCNU <sup>(L,C)</sup>	3) CUG <sup>(L,C)</sup>	3) HUST <sup>(L,C)</sup>	3) HZAU <sup>(L, C)</sup>
4)HUST <sup>(L,C)</sup>	4)CUG <sup>(L,C)</sup>	4) CUG <sup>(L,C)</sup>	4) HUST <sup>(L,C)</sup>	4) CUG <sup>(L,C)</sup>	4) CUG <sup>(L,C)</sup>
5)HZAU <sup>(L,C)</sup>	5) HZAU <sup>(L,C)</sup>	5) HZAU <sup>(L,C)</sup>	5) HZAU <sup>(L, C)</sup>	5)HZAU <sup>(L,C)</sup>	5) HUST <sup>(L,C)</sup>

### 1.2 Statistical Results Obtained from ‘Business’ Streets

The results based on Wuhan business streets exhibit the amount of content published on Weibo and to identify the various corners of business streets, which are extensively used with the help of peoples’ footprints. The field survey of each street was done on different dates to understand which street is more frequently used in week or weekend. The statistical results of streets are shown in *Figure 8*.



**Figure 8:** Commercial Streets with frequently published on Weibo from 2012-17



Secondly, Optics Valley Street consists of various shopping malls and different architectural buildings. Statistical analysis shows that Han street showed the maximum peak of Weibo data obtained in the year of 2012 specifically with comment data. In Optics valley the maximum peak of Weibo data obtained in the year of 2017 is more with comments. The trend of visits through statistical analysis *Table 2* explains the favorite, likes and comments of famous business streets in different years.

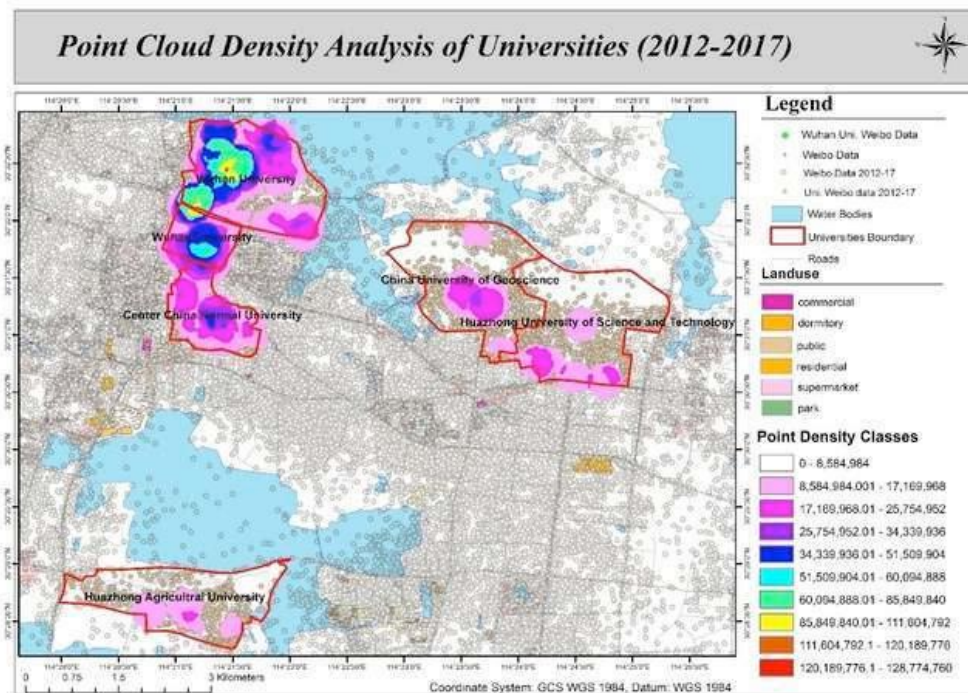
**Table 2:** Comparison of Likes and Comments of Business Streets where (L) stands for Likes and (C) stands for Comments

2012	2013	2014	2015	2016	2017
<b>Hanjie</b> <sup>(L,C)</sup>	Jiangnan <sup>(L,C)</sup>	Optics Valley <sup>(L,C)</sup>	Optics Valley <sup>(L,C)</sup>	Hanjie <sup>(L)</sup> Hubu Alley <sup>(C)</sup>	Optics Valley <sup>(L,C)</sup>
<b>Jiangnan</b> <sup>(C)</sup> <b>Hubu Alley</b> <sup>(L)</sup>	Optics Valley <sup>(L,C)</sup>	Jiangnan <sup>(L,C)</sup>	Jiangnan <sup>(L,C)</sup>	Hanjie <sup>(C)</sup> Optics Valley <sup>(L)</sup>	Hubu Alley <sup>(L,C)</sup>
<b>Optics Valley</b> <sup>(L,C)</sup>	Hubu Alley <sup>(L,C)</sup>	Hubu Alley <sup>(L,C)</sup>	Hubu Alley <sup>(L,C)</sup>	Optics Valley <sup>(C)</sup> Hubu Alley <sup>(L)</sup>	Hanjie <sup>(L,C)</sup>
<b>Alley</b> <sup>(C)</sup> <b>Jiangnan</b> <sup>(L)</sup>	Hanjie <sup>(L,C)</sup>	Hanjie <sup>(L,C)</sup>	Hanjie <sup>(L,C)</sup>	Jiangnan <sup>(L,C)</sup>	Jiangnan <sup>(L,C)</sup>

## Clustering Algorithms for Universities

### *Point Cloud Density Analysis*

The density diagram generated based upon the points clusters and process in the study area will be known as the point pattern [12]. This type of data is especially important for study including social media networks, structure, for example, Girvan and Newman, (2002) have built a community structure by using centrality indices to discover community boundaries [13]. The point cloud density analysis of Weibo data within the boundaries of different universities were applied to check the frequently visits depending on favoritism, beauty and content published.

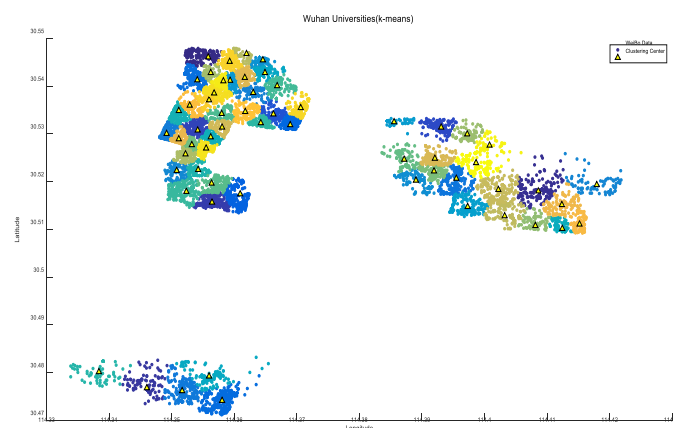


**Figure 9:** Maps Layout of Weibo Point Cloud density of Universities showing high (red), intermediate (green) and Low (pink) regions.

Through all years (2012-2017) Wuhan University is full of red regions as compared to other universities in Wuhan which explains its beauty and attractiveness. Moreover, statistical analysis on Likes and Comments is carried out which better explains and verifies the favorites, commentary, and content published of the aforementioned place as shown in Table 1.

### *K-means Clustering Algorithm*

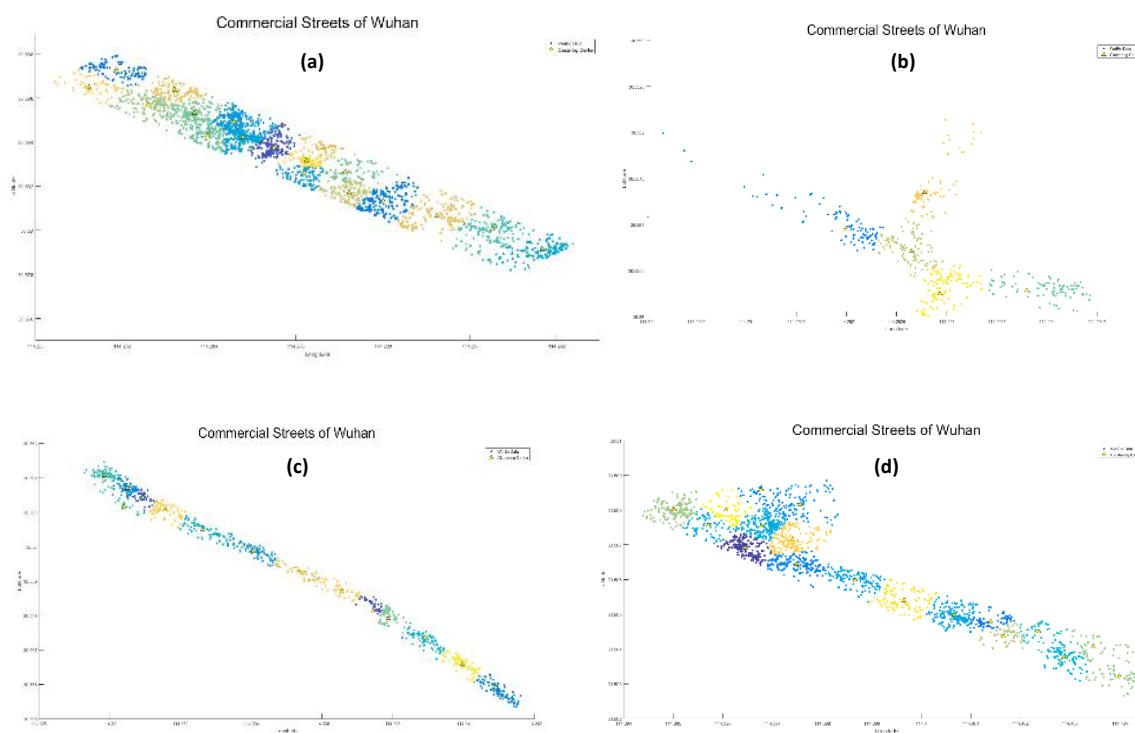
K-Means for major Universities is shown in Figure 10. This computed cluster refers to a collection of data points aggregated together because of certain similarities. For this purpose, we taken target number  $k$  for each cluster, which refers to the number of centroids need in the dataset of each universe.



**Figure 10:** Clustering through K- Means showing centricity of different colored clusters within Universities.

The ‘means’ obtained from the cluster in the K-means refers to averaging of the Weibo data within each university boundary that is, by using the centrality of clusters. Whereas the centroid is the imaginary or real location representing in the form of a triangular shape in the center of the clusters. Results obtained from K-mean proven that the majority of centroid point find for Wuhan university which predicting the major cluster gathering of Weibo points Data.

*K-means algorithm for Major Wuhan Commercial Streets is shown in Figure 11.* The K-means algorithm in data started with a group of randomly selected Weibo points which are used as the beginning points for every cluster and then perform repetitive calculations to optimize the positions of the centroids for each street boundary.



**Figure 11:** K-Means clustering of Jiangnan Street (a), Hubu Alley (b), Han Street (c), and Optics Valley (d) with their multi-color cluster centroids.

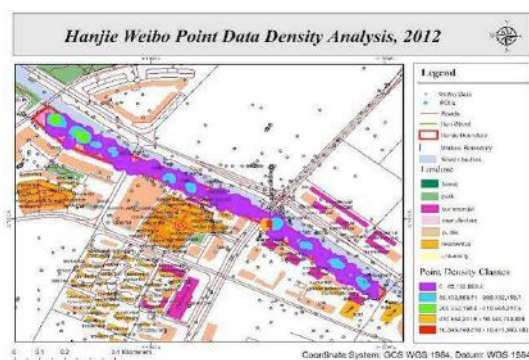
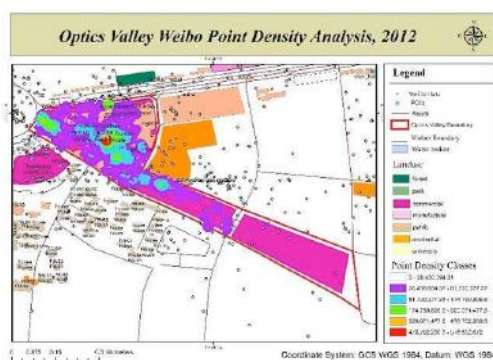
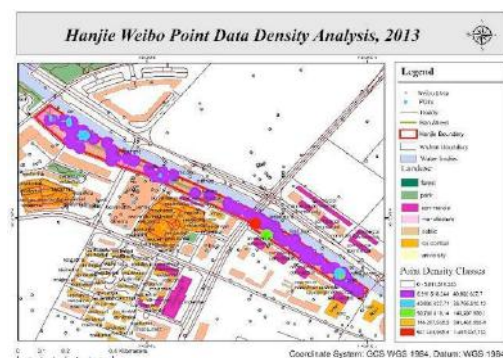
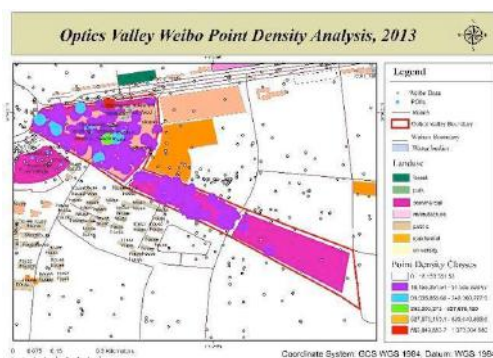
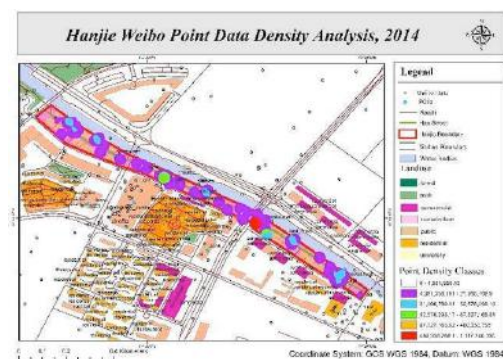
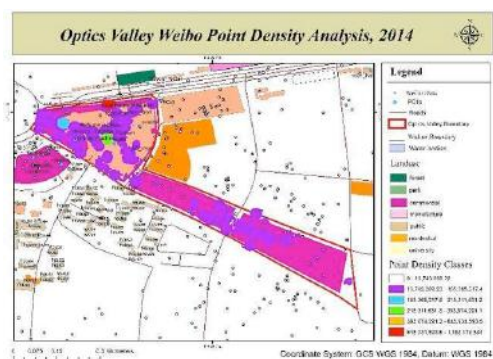
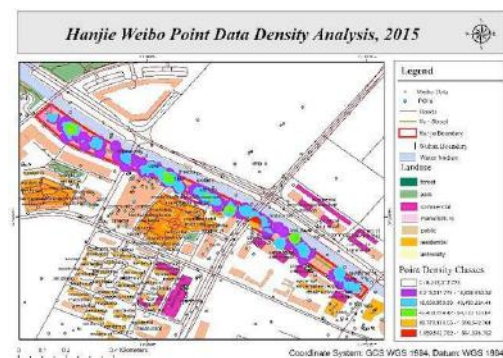
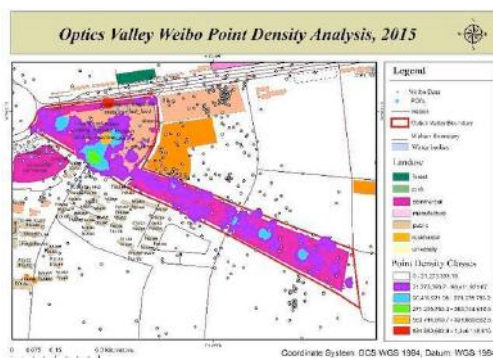
The dense cloud of the point indicated the zone with major K means clustering in street sites. For Jiangnan Street the majority K-cluster centricity found in the middle of the street as shown in Figure 11 (a) and for Hubu Alley majority of the mean-cluster lies at right cross-section of the street as expressed in Figure 11 (b). In Han street, the K-means of cluster varying throughout the street as shown in Figure 11 (c) and for Optics Valley major clustering found at the beginning of the street as shown in Figure 11 (d). All the results obtained through K-mean clustering also verify the results obtained through point cloud density.

#### *Clustering Algorithm for Pedestrian Commercial Streets*

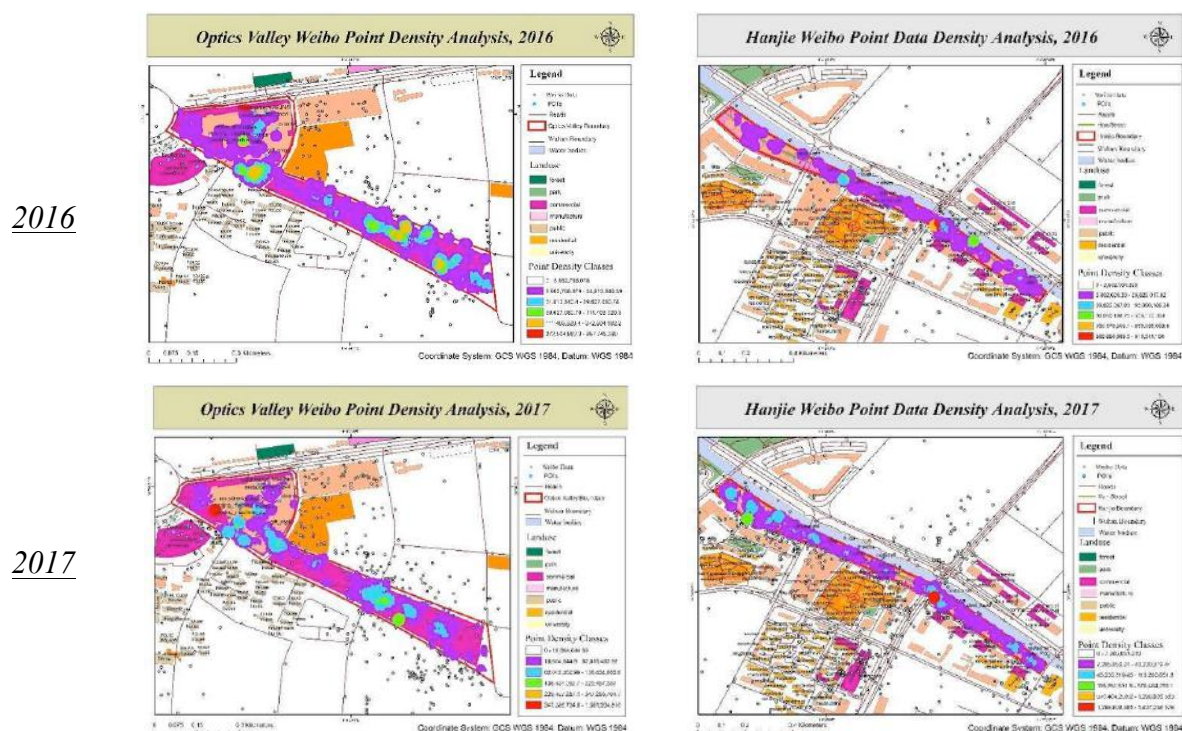
The density maps are shown in Figure 12 where red color giving us information about the dense regions, green with intermediate visits and purple with least visited sited within commercial pedestrian streets. The number of clusters indicates mostly visited and for real-estate business benefits.



Year.

*Optics Valley**Han Street*2012201320142015





**Figure 12:** Spatio-temporal Point Cloud Density Analysis (2012-2017) of Optics Valley (left column) and Han Street (right column)

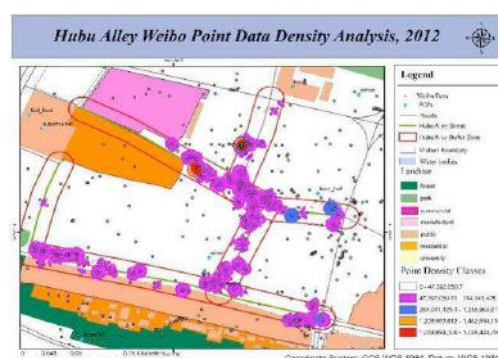
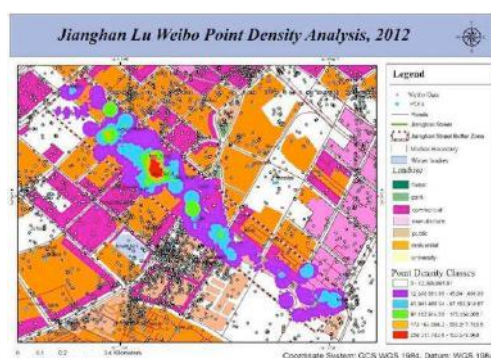
Similarly, the different color in the map gives us various information about the surrounded land-use area. Results of each street based upon the statistical analysis of Weibo data obtained in the GIS domain through this we can identify which street is more recognize with maximum data content published in different times year.

Year

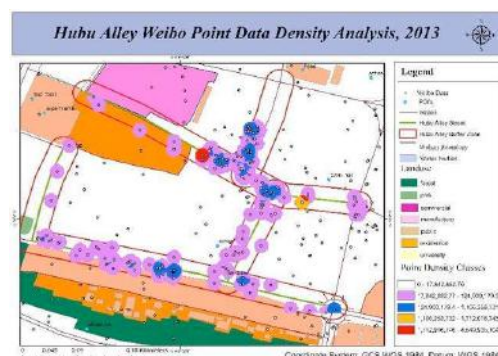
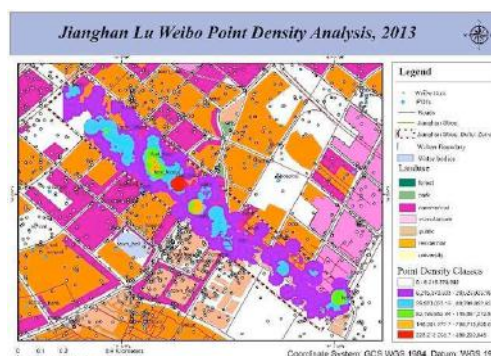
*Jiangnan Lu*

*Hubu Alley*

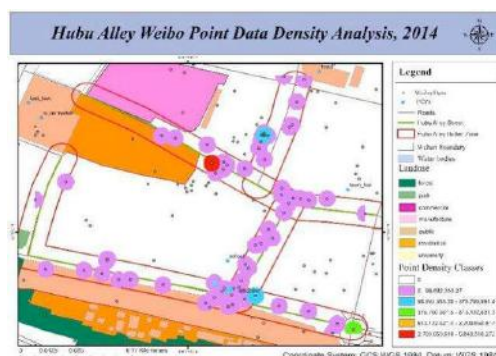
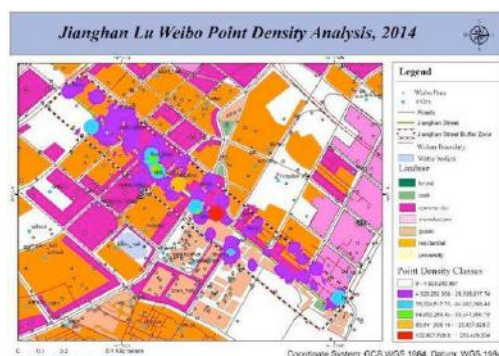
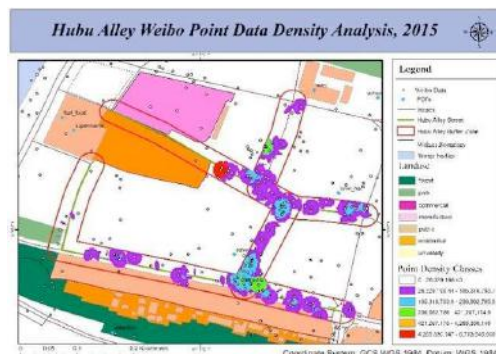
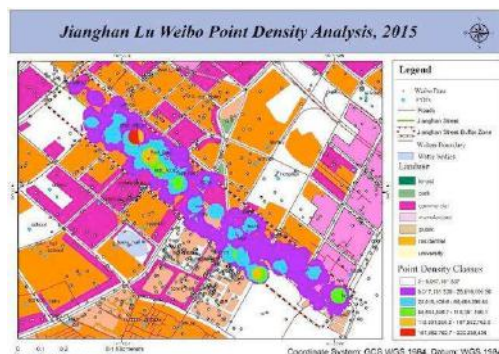
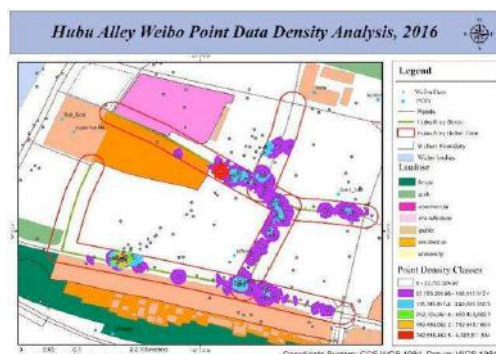
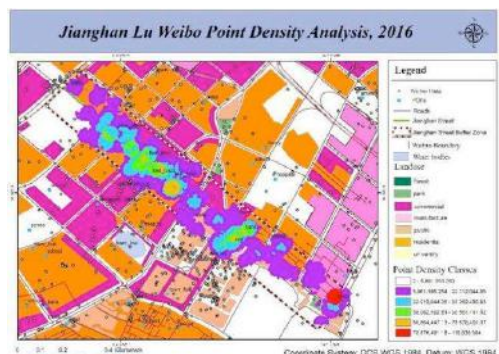
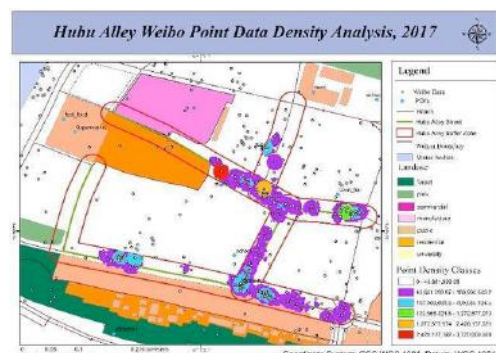
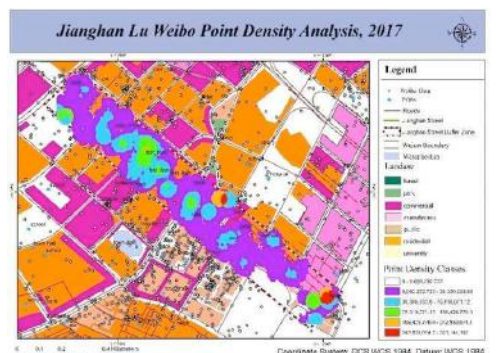
**2012**



**2013**





2014201520162017

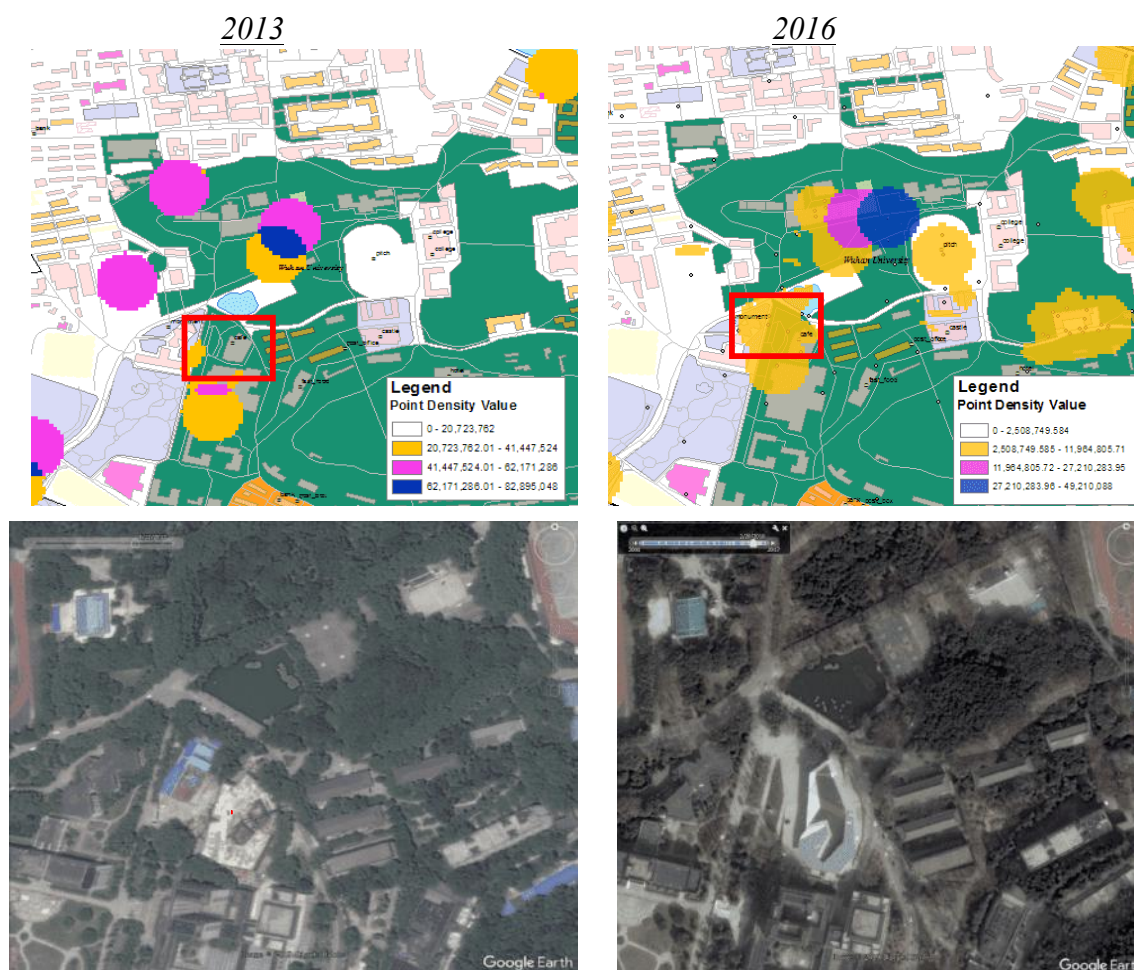
**Figure 13: Spatio-temporal Point Cloud Density Analysis (2012-2017) of Jiangnan Lu (left column) and Hubu Alley (right column)**

Spatial-temporal maps layout of different streets from 2012 to 2017 are shown in *Figure 12* and *Figure 13*. The red, yellow green, blue, and purple regions indicate the highest, high, intermediate, low and lowest dense regions respectively within the streets. The red region in all the maps at the same place indicates most visited region or shops of that street which is beneficial for real-estate Business.

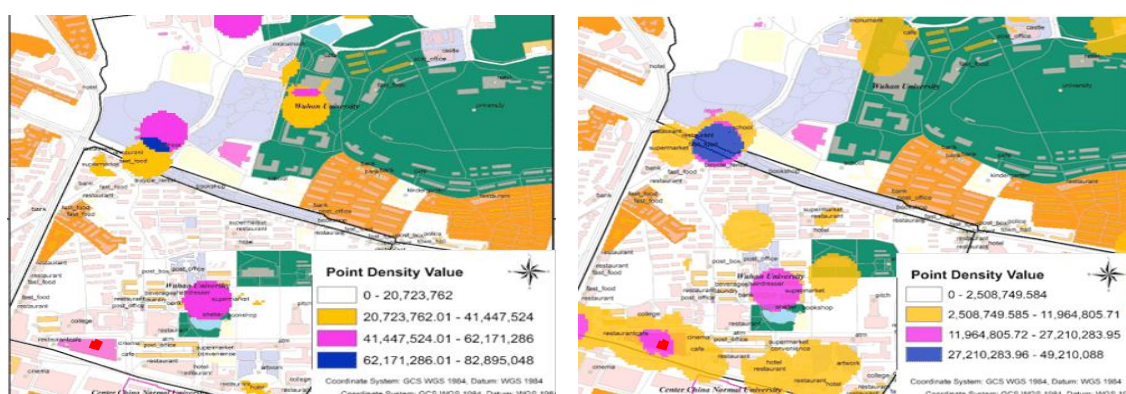
## Change Detection

### i. Change in Development in Wuhan University

One of the Major Landmark (Museum) in Wuhan University named as Wanlin Art Museum was completed in end of year 2015 and many people visited this attractive place in 2016 which showed a denser region in that area in 2016 which exhibit the change in development within Universities as shown in *Figure. 14*



**Figure 14:** Source: Google Earth pro, Detection of two Images from Google Earth and the corresponding difference in Point data Weibo clusters in 2013 (left) and 2016 (right)





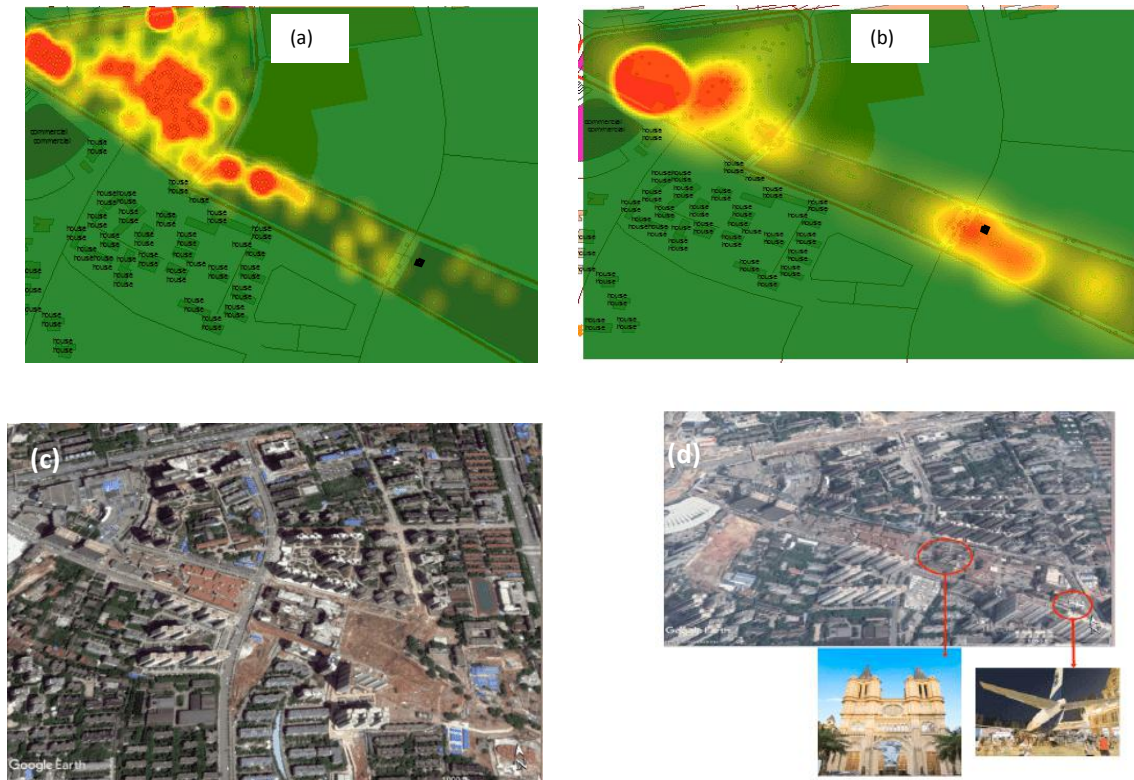


**Figure 15:** Change Detection in Build-up alongside the road besides Wuhan University in the year 2013 (left) and 2016 (right)

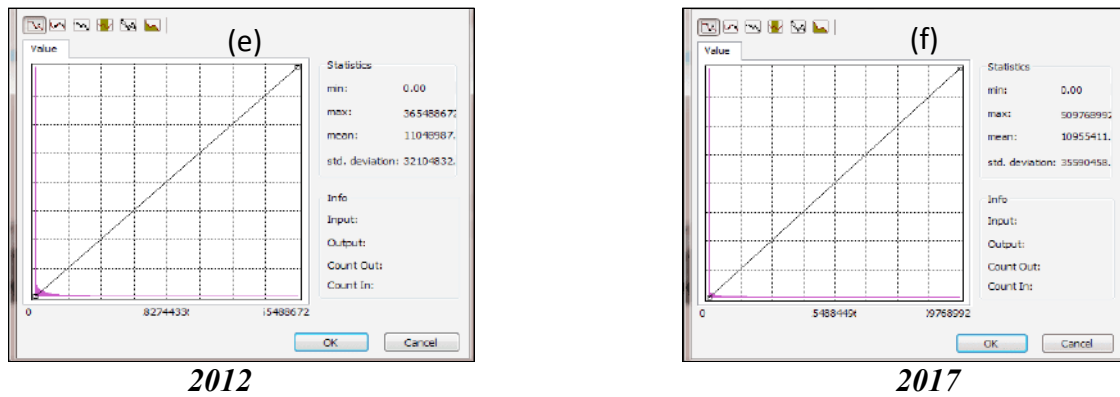
The change is verified through Google Earth's temporal optical imagery. Similarly, one of the buildings along the main road beside Wuhan University which was can be seen started in 2013 through optical high-resolution imagery which was totally constructed in 2016 which showed a big denser region around that area as shown in *Figure 15*.

ii. *Change in Development of Optics Valley Pedestrian Street*

Optics Valley Comparison using Kernel Density between 2012 and 2017. *Figure 16* shows the optics valley stretched kernel density indicating the change in development in the middle of the street and histogram shows the change in maximum and mean values with the change in standard deviation values indicating the change in the data.





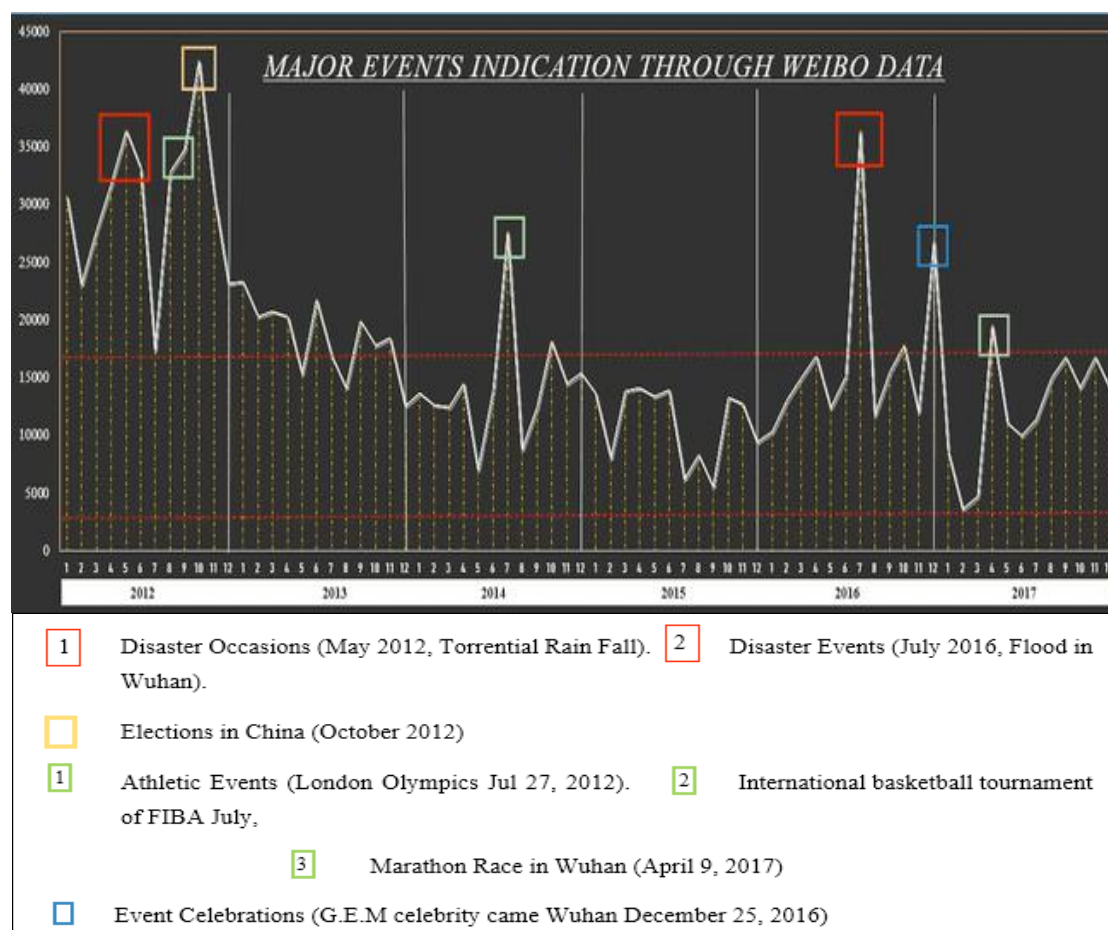


**Figure 16:** (a), (b) shows the optics valley stretched kernel-density where and (c), (d) images taken from Google Earth (e), (f) showing histogram

The difference found in Weibo data at different times of year might give us the clue that there could be some activity that took place in that area. The long term study and through Weibo data analysis clarified that the area was under construction in 2012-2014. After 2015 the Boeing 737 airplane as a restaurant in the Optics Valley Pedestrian Street was placed and newly built Cathedral church around the area of Optics valley made the people taking photos, and publishing their geo-location based data content in the form of likes and comments on Weibo. Optics Valley Pedestrian Street became a hotspot in Wuhan, Hubei Province, China and due to built-up of different architectures and multi-country style buildings people liked to visit the other end of the street from 2016-2017 as shown in *Figure 16*.

#### *Major Events Indication through 'Weibo'*

The one of the main findings include the flowing indication about all those past hot events containing peaks based upon comment count and comparison study of events depending upon the number of comments from 2012-2017 (month-wise).



**Figure 17:** Peak-valley graph indicating Major hot past Events through Weibo.

The Red box shows hazard events, green box explains sports event, blues showing celebrity visit in Wuhan and yellow box showing elections.

In 2012 the number of comments was very high even the least number of values in June-2012 is approximately equal to the highest values peaks (red box) in 2016 which indicate the hazards. In mid-June, Wuhan recorded the worst levels of air pollution in a decade. Moreover, different Media and news reports suggest and included pictures and content published on social media of Hubei's capital covered in a greenish-yellow smog [14], and in 2016 there was extreme precipitation which caused the flood in Wuhan [15]. Moreover, the highest peak in 2012 from October to November which shows the major event in China which were Elections in China from October 2012 to March 2013. Afterward, from July to August the rise in comments can be seen because of the London Olympics 2012 which was from Jul 27, 2012 – Aug 12, 2012. Similarly, in 2014 and 2017 there were FIBA championship [16] and Wuhan Marathon respectively which are shown in *Figure 17* (green box).

## CONCLUSION

For this study Wuhan is selected as the main research area and combines the collected microblog data, POI data and OSM road network dataset with remote sensing image data of the research area from 2012 to 2017, using spatial-temporal analysis. Through spatial analysis and statistical analysis of microblog data carried out in the past six years. The results obtained from Open Street Map indicate that Wuhan University is one of the universities considered to be the favorite, commentary and content release. The spatial and statistical results of different

commercial streets and their comparison show that 2012 was the year of Han Street (completed on September 30, 2011), and Optics Valley showed the maximum number of likes and comments posted in 2017. The clustering algorithm (K-Means) and kernel density analysis techniques were used to generate a time-space density cloud of microblog data for higher-educational institutes and commercial pedestrian streets. The main objective of finding the socio-economical sites was achieved through different density analysis. Higher density cloud of people in the map layouts indicate the business sites within the streets and beneficial for real-estate business. Changes in the movement patterns of crowds and development in Wuhan's well-known streets and universities were detected which were verified using Google Earth's high-resolution imagery. The peak-to-valley analysis of Weibo data reveals past hot events. The analysis shows that the content data based on comment counts from 2012 to 2017 reveals many Spatio-temporal events, including public issues such as human behavior, hot topics, and real-estate business sites which will be deeply explored in future by using natural language processing techniques.

## **ACKNOWLEDGEMENT**

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***Factors Contributing to Quality Performance in a Foundation English Course at  
a Higher Educational Institution***

Marcia Conway, University of Guyana, Guyana

The European Conference on Education 2022  
Official Conference Proceedings

**Abstract**

The knowledge of English language is important for the educational, economical, and national development of a country where the official language is English. There is a growing concern about undergraduates' quality in performance in the English language course at the States' University. The objective of the study is to examine the factors contributing to quality performance in the foundation English course, ENG 1105: Introduction to the use of English at a State University in Guyana. The scope of this quantitative study involved both English majors and non-English majors, across the population. The population consisted of 254 registered students. Through the process of simple random sampling 20% was selected. Responses from the 80 participants showed that lecturers' pedagogy, attitudes of learners and learning preferences, were factors that influenced performance in this course. The findings and conclusions indicate that the three factors: Lecturers' pedagogy, undergraduates' attitudes toward their learning and particular learning preferences significantly influence their performance and therefore, performance in English language as a subject may be improved. It is recommended that more lecturers attend professional development sessions to enhance their pedagogical skills. Lecturers should encourage and create situations where learners can develop positive attitudes towards the teaching and learning process. Implications include having lecturers use different pedagogical skills and incorporate various student activities both curricular and non-curricular activities which may stimulate students' interest towards learning, and may help undergraduates to improve their English language and comprehension skills.

**Keywords:** Students' Performance, Lecturers' Pedagogy, Learning Preference, Social Factor

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## Introduction

The course, Introduction to the use of English is a foundation mandatory course, required for all students who enter this state University in the faculty of Education and Humanities. The ENG 1105 course introduces students to English language as it is used in academic settings, targets the development of reading and writing skills, and aims to provide interactive settings for students. (See appendix 4). Further, this course aims to develop and increase students' language awareness, and mastery of oral and written Standard English. The criteria for pursuing the ENG 1105 course can be optional. Candidates can either have at least a grade 1-3 in English A at the Caribbean Secondary Education Certificate (CSEC) or the Caribbean Advanced Proficiency Examination (CAPE). Persons with a trained certificate from the Cyril Potter College of Education (CPCE) can also register for this course or candidates not possessing those 3 requirements, can complete the University's Entrance Examination (UGEE).

## Background to the Problem

Globally, the main objective of education in any democratic society is to provide learners with a quality education that enlightens them to be productive members of society (Kundu & Tutoo, 2000). With globalization, the English language being a form of communication is seen as important worldwide, and learners must perform well to assist in both economical and national development.

A study done by Malik et al. (2016) indicated that the academic performance of students has a direct impact on the socio-economic development of a country. Therefore, the development of any nation or community depends largely on the quality of educational opportunities available to its human resources.

Lecturers have expressed concerns about the poor performance in English A as a core subject. They were concerned about the poor writing, grammar, and comprehension skills that are often displayed by students in the completion of assignments. These qualities were also demonstrated in their final examinations, both written and oral presentations not only in the foundation ENG 1105 course, but in other courses in their field of study.

In addition, there were concerns about the admission level. Even though students have excelled at the Caribbean Secondary Education Certificate (CSEC) or Caribbean Advanced Proficiency Examination (CAPE), (Grades A or I), they perform below the passing grade of C in the ENG 1105 course (table 1).

<b>Academic Year</b>	<b>No. of Students</b>	<b>Good Performance A-C</b>	<b>Poor Performance D-F</b>
2016/2017	199	105 (53%)	94 (47%)
2017/2018	184	76 (41 %)	108 (59 %)
2018/2019	260	101 (38 %)	159 (62%)

Table 1. Performance of students in ENG 1105 at the campus over a three-year period 2016/2017 to 2018/2019



There was a pattern of more students obtaining grades D-F rather than good performance within the range of grades A-C over three years. Also, an examination of the Caribbean Secondary Education Certificate (CSEC) English 'A' results and the CSEC Report on the performance of English in Guyana for the past three years (2017 to 2019), indicate an improvement in performance in this area. However, despite this "slight" improvement, some students are still underperforming in other English courses.

## **Research Questions**

The following questions were constructed to gather data on factors influencing performance in the ENG 1105 course at the University.

- To what extent is the lecturers' pedagogy a contributing factor to the quality of performance in ENG 1105?
- To what extent are undergraduates' attitudes toward learning responsible for their performance?
- To what extent do learning preferences have on the performance in the ENG 1105 course?

## **Methodology/Population**

Participants in this study consisted of 20% of the 254 students registered for the course, ENG 1105. The participants were all registered students at a campus of this state University. The respondents in this study were 19% male and 81% female. There were two participants with ages ranging from 16-25 years, twenty-six between 26-35 years, forty-five between 36-45 years and, seven between the range 45 years and above.

The quantitative design was used and the simple random sampling methodology was done. In addition, the LIKERT scale Questionnaire-LIKERT scale -(LIKERT Scale type). (1- Strongly disagree (SD), 2- disagree (D), 3-agree (A) and 4 strongly agree (SA) was used to obtain data for this study

## **Literature Review**

### **1.1 Theoretical Framework**

The Reciprocal Teaching Method and the Experiential Learning Theory (learning styles model) were used as the theoretical framework for this study. Kolb's theory showed that experiential learning could be applied to any subject matter. It encourages learners to play an active role in the learning process to build knowledge, skills, values, and attitudes via direct experience. Experiential learning activities have shown to increase learners' knowledge and grades, and improve their attitudes towards challenging materials (Kolb, 1984). Studies in support of the experiential learning theory found that by incorporating this theory in higher education settings, there were improvements in academic performance (Reitmeier, 2000).

Reciprocal teaching is an approach that teach learners to become responsible for their reading and employ metacognitive reading strategies over cognitive reading strategies (Cohen, 1998). It is also seen as an educational teaching /learning strategy that helps efficient readers to improve their reading comprehension skills and become independent readers.

According to Kotti (2008), experiential learning refers to the organization of the learning process based on the pedagogical principle of “learning by doing”, which indicates that learners acquire knowledge after an experience or change in events.

## 1.2 Conceptual Framework

A conceptual framework is a model that employs the use of drawings/diagrams to explain the interrelationships between variables (Orodho, 2009). It helps to identify and clarify what you know and value as central aspects of a study and then connect these with the various other aspects of influences on research.

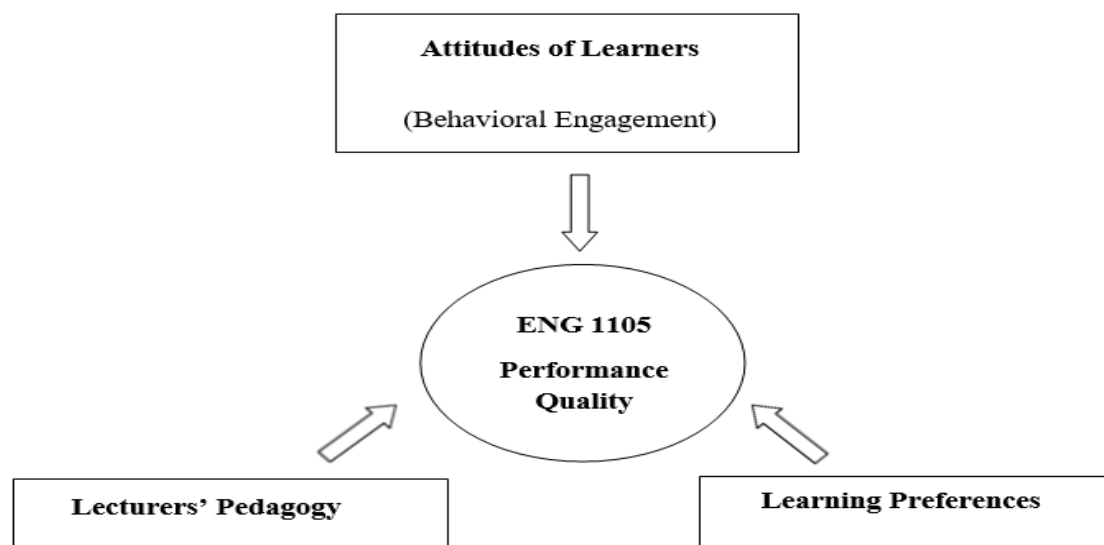


Figure 1: Conceptual Framework Consisting of Variables That Guided the Research

The conceptual framework indicates how the factors will influence performance quality in ENG 1105, Introduction to the use of English. The model shows the relationship between the different variables and performance quality in the course ENG 1105.

Further, the diagram shows that performance quality as a dependent variable is related to the variables; the lecturer's pedagogy, learning preferences, and attitudes of learners.

## Summary of Literature Review

The issue of performance in the English language is seen as a researchable topic that has caught the attention of many researchers. Studies have indicated some possible factors that have contributed to the performance of learners at the higher education level and more so, the University Level in many English and non-English speaking territories. The literature provided pieces of work that showed teacher pedagogy and experience, learners' attitudes towards learning, and subject matter as contributors to the quality of performance. A study done by Beijaard and De Vries (2008) indicated that the teacher's beliefs and their pedagogical knowledge about teaching and learning are closely connected and to some extent, both pedagogical and subject matter impacts the teaching and learning process. In addition, other researchers have advocated that most teachers teach according to how they have first learned (Stitt-Gohdes, 2001).

As a result of the different ideologies of researchers, the researcher believes that lecturers' pedagogy can impact student performance both negatively and positively, and as such, there is no "one" or "best" approach to curriculum delivery at the university level. The literature also argued that learners' attitudes and engagement are factors that can contribute to quality performance. In support of this statement, Fishman & Cooper (1974) argued that language attitude must include aspects such as an individual's attitude towards the use of language and an equally important attitude towards language as a subject. On the contrary, Mullins (2015) noted that a negative attitude toward learning could result in learners performing poorly preventing them from obtaining the required results for university entrance. This comprehensive review of literature has highlighted learners' interests and learning preferences as influencing factors in the quality of performance in English language courses. Research done by Heller et al. (2003) noted that the extent to which students' interests are incorporated is significantly related to their academic achievement and that the inclusion of students' interests in the learning process increases student engagement in the learning process and therefore, positive student engagement can positively impact student achievement. Generally, the literature presented empirical research findings and suggestions that can impact and influence the quality of student performance both positively and negatively, as such, the researcher will pursue this research to determine factors influencing performance in ENG 1105 at a state University in Guyana.

### Presentation and Analysis of Results

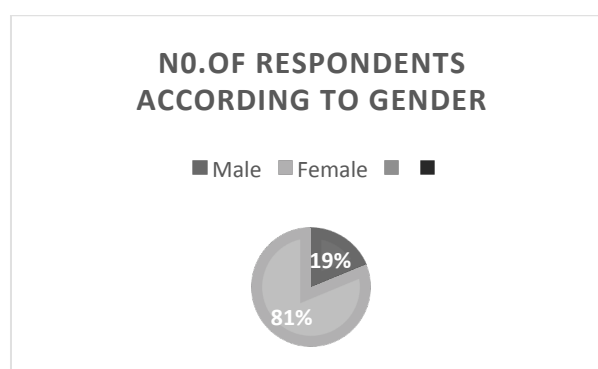


Figure 2: The Percentage Breakdown of the Participants According to Their Gender

From the 80 participants, 15 were male and 65 females. This indicates that a significant number of participants were females.

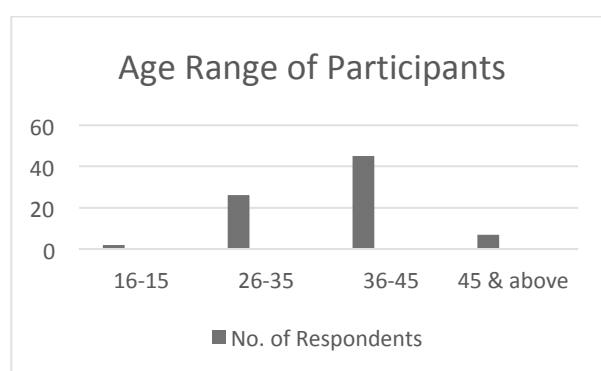


Figure 3: An Analysis of the Age Range of Participants

There were two participants with ages ranging from 16-25 years, twenty-six between 26-35 years, forty-five between 36-45 years and, seven between the range of 45 years and above. This clearly shows that there is a significant number of respondents ranging between 36-45 years and above.

<b>Faculty/Division of Study</b>	<b>Number of Respondents</b>
Agriculture & Forestry	3
Education & Humanities	46
Natural Sciences	5
Social Sciences	26
School of Entrepreneurship and Business Innovation (SEBI)	0

Table 2. The number of participants according to their faculty area of study

There were three respondents from the division of Agriculture and Forestry, forty-six from Education and Humanities, five from Natural Sciences, and twenty-six from Social Sciences. The table indicates that a significant number of participants from both the faculty of Education and Humanities and Social Sciences were randomly selected for this study.

<b>Year of Study</b>	<b>No. of Participants</b>
1 <sup>st</sup>	<b>34</b>
2 <sup>nd</sup>	<b>46</b>
3 <sup>rd</sup>	<b>0</b>
4 <sup>th</sup>	<b>0</b>

Table 3. The year of study for all participants in this study

A total of 34 participants were in their 1<sup>st</sup> year of study while 46 were in their 2<sup>nd</sup> year. There were no participants in their 3<sup>rd</sup> and 4<sup>th</sup> years because the course ENG 1105, is offered in the first year of the semester for all other university students at the Campus except for students from the Faculty of Education & Humanities who are required to complete this course in their 2<sup>nd</sup> year.

Items	SD		D		A		SA	
	F	%	F	%	F	%	F	%
1.The lecture method is the main method used throughout the ENG1105 course.	12	15	15	19	32	40	21	26
2.Probing is one teaching method used by my lecturer to assist students with learning difficulties	47	59	21	26	9	11	3	4
3.The lecturer for ENG1105 conducts him/herself in a professional manner	15	19	5	6	59	74	1	1
4.My ENG1105 lecturer always provide feedback on completed assignments	12	15	17	21	48	60	3	4
5. There is a balanced between learning activities and course content for ENG1105.	7	9	57	71	14	17	2	3

Table 4. Frequency and Percentage of Participants' Responses to the Cluster of Items Related to Research Question One

Items	SD		D		A		SA	
	F	%	f	%	F	%	f	%
1.I am responsible for my own learning in the ENG 1105 course.	6	8	33	41	40	50	1	1
2.I do not feel enthusiastic to attend my ENG1105 class sessions	6	8	20	25	37	46	17	21
3.My dislike for English A at secondary school translates into my English course at UG	17	21	22	28	32	40	9	11
4.I am always actively engaged in the tutorial sessions of ENG1105	40	50	18	23	12	15	10	12
5.Group work creates a motivating environment to learning and succeeding in English language	18	22	55	69	6	8	1	1

Table 5. Frequency and Percentage of Participants' Responses to the Cluster of Items Related to Research Question Two

Items	SD		D		A		SA	
	F	%	f	%	F	%	f	%
1.I prefer to work independently rather than with my colleagues	9	11	14	17	31	39	26	33
2.Oral presentation is always a challenge for me during the ENG1105 course	0	0	0	0	7	9	73	91
3.I learn best by reading handouts rather than having the lecturer dictate to the class	8	10	4	5	62	77	6	8
4.I enjoy working in small groups	0	0	0	0	8	10	72	90
5.I explore and complete thorough research on English assignments given by my lecturer	7	9	9	11	53	66	11	14

Table 6. Frequency and Percentage of Participants' Responses to the Cluster of Items Related to Research Question Three

## Analysis of Results

Q 1-Data in the table revealed that 66% of the respondents agreed that the lecture method is the main method used throughout the ENG 1105 course while 14% disagreed. For item 2: Probing is one teaching method used by my lecturer to assist students with learning difficulties, 85% of the students were disagreed with this item compared with 15 % who agreed. Responses to item 3 revealed that 75% of the respondents agreed that the lecturer for the ENG 1105 course conducted him/herself in a professional manner during lectures while 25 % felt this is not so. For item 4, 64% of the respondents claimed that lecturers of ENG 1105 always provided feedbacks on completed assignment compared with 36% claimed that they were not in agreement with the item. Interestingly, 80% of the students indicated that there was no balance between learning activities and course content for ENG 1105.

Q 2-Responses to item 3 in this cluster revealed that 49% of the students said that the dislike for English A at secondary school moved with them in English courses at the university compared with 51% who disagree. Additionally, for item 4, 73% of the respondents disagreed that they were actively involved in tutorial sessions in the ENG 1105 course. Further, 91% of the participants disagreed that group work creates a motivating environment to learning and succeeding in ENG 1105.

Q 3- Data in the table shows that 72% of the respondents agreed that they preferred to work independently rather than with colleagues compared with 28% who disagreed with the item. Responses to item 2 in this cluster revealed that 100% of the students indicated that oral presentations always challenged them during the ENG 1105 course. For item 3, 85% of the respondents indicated that they learn best by reading handouts rather than having the lecturer dictate to the class compared with 15% who disagreed with the item. Responses for item 4 indicated that 100% of the students were in agreement that working in small groups was enjoyable.

## Findings from the data collection procedure

- Lecturers' pedagogy had an impact on students' performance.
- lecturers using the most effective pedagogy will capture the attention of the students in the ENG 1105 class.
- Lecturers need to use more creative teaching techniques in this course that will stimulate the students' interest and motivate them to learn English. On the other hand, if the teacher does not have excellent pedagogical skills to competently teach ENG 1105 then the students will continue to fail the subject.
- Attitude- undergraduates' attitude towards learning is responsible for their quality of performance.
- students need to be self-motivated. However, if they portray negative attitudes towards the subject, this can be an obstacle towards learning.
- The preferred learning style had an impact on the performance in the ENG 1105 course. Lecturers must know their learners in terms of their learning preference and plan accordingly.
- Lecturers must plan for audio learners, visual learners, the audio-visual learners, the spatial learners and should also possess the ability to influence the students in having a personalized process of learning and ensuring that students are familiar with the English culture.

## Conclusions

The study concluded that lecturers' pedagogy was the main influencing factor in performance level at the State University. Findings indicate that lecturers who use more creative teaching techniques in this course will stimulate students' interest and motivate them to learn. Further, lecturers who use the most effective pedagogy will capture the attention of the students in the ENG 1105 class.

Attitudes of students towards their learning were found to have an impact on academic performance. The findings indicate a positive significant relationship between students' attitudes and performance in the ENG1105 course. Further, if students have positive attitudes toward ENG 1105 at the State University, they will persuade themselves to learn it at all costs. In addition, the findings show that lecturers must be cognizant of the preferences in learning of their students. Learning preferences should be accommodated by activities tailored to meet students' needs. Therefore, ENG 1105 lecturers must plan for audio, visual, audio-visual, and spatial learners to influence students in having a personalized process of teaching and learning.

In general, the research study led to the conclusion that performance in English would greatly be enhanced through improvements on the three influencing factors examined in this study. Lecturers' pedagogy, learning preferences, and attitudes of learners were the factors influencing performance in the ENG 1105 course at the State University. Recommendations and implications seek to address improvements in these areas.

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***Teacher Agency in the Context of Curriculum Reform: An International Scoping Review***

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**Abstract**

In parallel with neoliberal curriculum reforms taking place over the globe, teacher agency is increasingly recognized as a worthwhile research topic. Although the concept of teacher agency is fast becoming an educationally worldwide concern, there is little agreement on its conceptualization. Additionally, despite its real significance to educational changes, no previous study has attempted to collate international evidence on teacher agency enactment and how to support such agency in large-scale K-12 curriculum reforms. Therefore, this scoping review aims to: (1) clarify how teacher agency has been conceptualized in relation to curriculum reform; (2) uncover teacher's experience of agency in government-initiated reforms; (3) identify factors that possibly influence teacher agency. Following the procedure recommended by Arksey and O'Malley (2005), the author finally selected 10 empirical studies published in peer-reviewed Scopus indexed journals that met the inclusion criteria. Findings reveal that varied concepts and frameworks have been adopted to capture the complexity of teacher agency as it relates to system-wide curriculum reforms. It is also found that teachers in reviewed studies largely experienced tension and demonstrated different levels of agency across curriculum reform contexts. As emerging from the literature, their enactment of agency was supposedly impacted by personal, structural and cultural conditions. Whereas strong professional belief and collaborative school culture were the most likely to enable agency, contradictions between tools of the new curriculum and teacher's experiences and beliefs seemed to considerably constrain it. Implications for researchers, policy makers, school leaders and teacher trainers are discussed.

Keywords: Teacher Agency, Curriculum Reform, Scoping Review

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## Introduction

Over the last decade, teacher agency has received increasing attention in educational research, which can be seen in parallel with curriculum reforms taking place across nations. Globalization, human challenges, and the ills caused by the education system themselves have prompted many countries to implement comprehensive curricular reforms to prepare students for the 21st century (Gouédard et al., 2020). Notably, many of these reforms have adopted neoliberal features such as decentralization, accountability, learning outcomes, and standardization (Fu & Clarke, 2019; Ryder et al., 2019). This movement has placed teachers at the center of the curriculum, who are held accountable for measurable outcomes (Fu & Clarke, 2019), and are thought to be policy actors holding the key to successful implementation of educational reform (Min, 2019; Ryder et al., 2018; Scanlon et al., 2021). Increasingly, teacher agency has become a worthwhile research topic in the context of system-wide curriculum reforms.

Although a large volume of literature has explored teacher agency, the number of review papers on this topic is limited. Cong-Lem (2021) reviewed teacher agency in general; Miller et al. (2020), teacher agency for inclusive education; Chisholm et al. (2019), teacher agency in language arts teaching; and Hinostroza (2020), teacher educators' agency in higher education context. However, no previous study has provided an overview of the literature on teacher agency in the context of curriculum reform.

To date, there has been little agreement among scholars on how teacher agency is conceptualized (Cong-Lem, 2021). Therefore, my first goal in this review is to clarify how researchers have defined teacher agency in relation to curriculum reforms and identify the theoretical frameworks they have used. Second, I expect to unearth teachers' experience of agency in national curriculum reforms and shed light on the factors impacting such agency.

The following questions guide my work:

1. How is teacher agency conceptualized in the literature as it relates to large-scale curriculum reform in K-12 education?
2. How do teachers experience agency in their country's curriculum reforms?
3. What are the enabling and constraining conditions for teacher agency in the context of large-scale curriculum reform?

## Method

To explore the extent to which this topic has been researched, I utilized scoping review and followed the procedure recommended by Arksey and O'Malley (2005).

### Identifying the research question

It should be noted that my focus was on *teacher agency* as a concept and the context was large-scale curriculum reform in K-12 education. I used research questions from the most promising articles to construct specific guiding questions for the review.

## Identifying relevant studies

The database search was Scopus due to its reliability and accessibility. I excluded books, book chapters, conference proceedings, essays, editorial introductions, and commentary from my search. I also excluded papers that were written in a language other than English. Guided by the research questions, I established the following criteria for final inclusion:

- Be peer-reviewed journal articles
- Be published in English language
- Report empirical results
- Focus on teacher agency (these words must be in the articles' title)
- Provide a clear conceptualization for teacher agency
- Highlight large-scale state-initiated curriculum reform in K-12 education as the context (curriculum reform must be the keywords and/ or included in the abstract and/or the reform context must be clarified in the literature review).

Used search queries were:

- *Teacher agency* OR *teacher agencies* (in title); AND *curriculum reform* (in title, abstract, keywords); AND NOT *university* (in title, abstract, keywords); AND NOT *college* (in title, abstract, keywords).

I got 22 results for this search string.

## Selecting studies

Next, I read the abstract, headings, rationale, and research questions of 22 candidate articles to find the ones matching my inclusion criteria the most. After the screening process, 10 articles were selected.

## Collating, summarizing and reporting the results

Selected papers were presented chronologically with descriptive information as follows.

Study	Participant	Setting	State of reform	Research method
Biesta et al. (2015)	6 classroom teachers	1 primary school, 2 secondary schools	Scotland	Ethnography
Bergh & Wahlström (2018)	10 teachers	Secondary schools; rural, middle-sized town, large city	Sweden	Qualitative
Fu & Clarke (2018)	8 physics teachers	1 high school, major city, mid-east China	China	Ethnography
Ryder et al. (2018)	13 science teachers	10 schools	Sweden	Qualitative
Fu & Clarke (2019)	10 physics teachers	1 top-ranked high school, major city, mid-east China	China	Ethnography
Min (2019)	605 teachers	Public primary schools; rural, urban, and suburban areas	Korea	Quantitative
Willis et al. (2019)	4 English teachers	2 senior secondary schools (1 regional government, 1 non-government)	Australia	Action inquiry
Poulton (2020)	6 teachers	1 state-funded primary school, metropolitan, multicultural students	Australia	Case study
Kneen et al. (2021)	19 Pioneer expressive arts teachers	8 primary schools, 8 secondary school, 2 special schools, 1 through school	Wales	Qualitative
Scanlon et al. (2021)	1 experienced PE teacher	1 post-primary school	Ireland	Case study

Table 1. Summary of selected papers

## Findings

### Participants, setting, and methods

As depicted in Table 1, ten articles covered 682 participants with varying teaching experiences. Three studies investigated high school teacher agency, whereas the rest focused on primary and secondary school teachers. Participants came from rural, urban, and suburban areas, mostly from public schools. The majority of them were classroom teachers; some were subject teachers in Physics, Science, English, Expressive Arts, and Physical Education. Interestingly, most research projects were conducted in Western countries where reforms were newly implemented, with only three studies carried out in the Asian context where national reforms have been underway for a long time.

Concerning research method, only Min (2019) utilized a quantitative approach; all the other adopted a qualitative research design. Three studies employed ethnography, two used case study design, and one utilized action inquiry with interviews, researcher's observations, field notes, teacher's reflections, and text analysis as the main sources of data. The other three collected data through interviews and observations.



## Conceptualizing teacher agency as it relates to curriculum reform

The first set of findings concerned this question: How is teacher agency conceptualized in the extant literature as it relates to large-scale curriculum reform in K-12 education?

Theoretical Framework	Studies
Ecological perspective	Biesta et al. (2015); Poulton (2020)
Social cognitive theory	Fu & Clarke (2018); Min (2019)
Sociocultural perspective	Ryder et al. (2018); Willis et al. (2019)
Dewey's transactional realism	Bergh & Wahlström (2018)
Combined approaches (Ecological model, structuration theory, Campbell's notion of moral agency, Bronfenbrenner's ecological framework for human development, figurational sociology)	Fu & Clarke, (2019); Kneen et al. (2021); Scanlon et al. (2021)

Table 2. Theoretical frameworks used in reviewed papers

As shown in Table 2, different theoretical approaches were employed to conceptualize teacher agency; the most used was the ecological perspective. According to Biesta and colleagues (2015), “[T]his concept of agency highlights that actors always act *by means of* their environment rather than simply in their environment”; in that sense, agency is not understood as a capacity “residing in individuals” but as an “emergent phenomenon of actor-situation transaction” (p. 626). To understand the achievement of teacher agency, studying the dynamic interplay between iterational, practical-evaluative, projective dimensions, and school ecologies is crucial (Poulton, 2020).

The next popular framework adopted was Bandura's social cognitive theory (Fu & Clarke, 2018; Min, 2019). Following Bandura's definition, Min alluded to teacher agency as “intentional acts” (Min, 2019, p. 2) that are shaped in interactions with environmental and personal factors. Teacher agency is emphasized as an individual capacity that is influenced by two factors: (1) teachers' self-efficacy and outcome expectations, and (2) the school culture in which they work. In contrast, Fu and Clarke (2018) concentrated on Bandura's concept of collective agency. Nonetheless, Fu and Clarke (2018) noted that teachers' individual and collective agency and curriculum reform “are studied as a complex system” and “neither agency nor structure is discussed without the other” (p. 48).

Ryder et al. (2018) and Willis et al. (2019) employed a sociocultural perspective and seemed to define teacher agency similarly. Ryder et al. (2018) alluded to teacher agency as “the professional goals of the teachers” and “the choices teachers make concerning their working practices” (p. 539) while Willis et al. (2019) described agentic teachers as those who “engage with new policies and make informed professional judgements about the design, practice, and consequences of classroom curriculum and assessment” (p. 234). However, whereas Willis et al. (2019) highlighted contextual factors and conceptualized agency as “a social role that is negotiated in practice, often in the collective of the classroom, or with peers in the broader collective of schools” (p. 234), Ryder et al. (2018) argued that it is personal goals and biography, separated from the broader structure, that determine teachers' agentic actions.

Adopting Dewey's transactional realism, Bergh and Wahlström (2018) focused on teacher agency “in the intersection between the ideal and the realistic”, associating it with “experiences in relation to the normative content of the curriculum” (p. 136) that are

“experienced by individuals in their interactions with a social and material environment” (p. 139).

Unlike the scholars mentioned above, authors in the other three studies combined different theoretical approaches. Despite using the ecological model by Priestley et al. (2013), Scanlon et al. (2021) examined iterational, practical-evaluative, and projective dimensions from Elias’s figurational lenses to better capture the complexity of teacher agency. Fu and Clarke (2019) and Kneen et al. (2021) used theoretical combinations to achieve their research goals. Whilst Kneen et al. (2021) employed Bronfenbrenner’s ecological framework for human development to examine pioneer teacher agency at the micro, macro, and meso levels, Fu and Clarke (2019) adopted structuration theory and Campbell’s notion of moral agency to better probe teachers’ moral agency.

Although there was no clear consensus among researchers, agency was generally characterized by conscious, intentional choices and actions *of* or *by* teachers, which influence and are influenced by the broader contexts in which teachers play a part. However, researchers seemed not to agree on the extent and in what ways the environment or the structure affects and interacts with teacher agency. The debate also centered on whether agency is an achievable state or an independent social factor. Despite differences in opinions, most researchers agreed that teacher agency exists in highly complicated relationships with different factors in relation to the curriculum. Thus, curriculum reforms provide a rich context for exploring teacher agency.

### **Teachers’ experience of agency in the context of large-scale curriculum reform**

It was obvious across ten studies that teachers were positioned as the main curriculum enactors in official reform discourses. However, the degree to which they felt autonomous seemed to vary. Teachers in Korea and China were supposedly entitled to more autonomy and influence over the curriculum (Fu & Clarke, 2018; Min, 2019), whereas teachers in Sweden and Australia appeared to have less (Bergh & Wahlström, 2018; Poulton, 2020).

In all cases, however, visible was the tension felt by teachers following the introduction of new curriculum. Swedish teachers in Bergh and Wahlström’s (2018) study reported serious dilemmas between idealistic and realistic aspects of the curriculum, whereas some interviewed teachers in Ryder et al. (2018) felt seriously untrusted and deprofessionalized.

Facing conflicts and tensions, teachers in the reviewed studies developed responsive strategies that in turn reflected their level of agency. In many cases, teachers were stuck in negative experiences and found it difficult to enact agency, as Biesta et al. (2015) clearly demonstrated. As these authors pointed out, expressions of insufficient agency included teachers’ reliance on new curriculum discourse to justify practices, “blaming students” (p. 631), “reluctance to rock the boat”, “strong anxiety about curriculum development” (p. 633), and “lack of discourse around purpose and values” (p. 635).

Nevertheless, some teachers found room to manoeuvre and exercised agency. Teachers in Bergh and Wahlström’s (2018) study, for instance, used curriculum change as an opportunity to reflect on their previous teaching beliefs, envision and adjust their practices to the new curriculum. In other cases, policy changes even led to creative tensions where teachers were motivated to try out new approaches (Ryder et al., 2018), collaborate with colleagues (Fu & Clarke, 2018; Kneen et al., 2021; Ryder et al., 2018), propose alternative assessment plans

(Poulton, 2020), protect students from negative aspects of the reform (Biesta et al., 2015; Fu & Clarke, 2019), rearrange curriculum content to enhance students' engagement (Scanlon et al., 2021), and mobilize different pedagogical methods to promote student learning (Fu & Clarke, 2018; Scanlon et al., 2021).

In short, teachers in the reviewed studies encountered tensions and dilemmas in reforms to varying degrees. In many cases, dilemmas remained unsolved, and the level of agency was weak. There existed, however, cases where teachers successfully negotiated multiple forces, resolved contradictions, and acted agentially. The following part offered possible explanations for this.

## **Enabling and constraining conditions for teacher agency**

In the context of large-scale curriculum reform, what are the enabling and constraining conditions for teacher agency? Three conditions emerge, including personal, structural, and cultural. As these conditions facilitate or hinder teacher agency in different ways, I will clarify the effect of each condition.

### **Personal conditions**

*Professional beliefs.* In half of the studies, teachers' professional beliefs were identified as an important factor contributing to agency (Biesta et al., 2015; Bergh & Wahlström, 2018; Min, 2019; Poulton et al., 2020; Ryder et al., 2018). As argued by Ryder et al. (2018), teacher's intentionality and personal goals created room for agency itself despite the imposition of external forces. Supporting this claim, Min's (2019) quantitative results confirmed a positive correlation of teachers' high levels of self-efficacy and outcome expectations with agency in curriculum practices. By contrast, "superficial understanding" of the reform and lack of a clear educational vision possibly restrained agency (Biesta et al., 2015, p. 636).

*Professional expertise.* In Australian assessment reform, teachers' familiarity with proposed changes, experiences with external assessment, adaptability (Willis et al., 2019), and assessment literacy (Poulton, 2020) were found to positively influence agency level. Deep content knowledge may facilitate Chinese teachers' agency (Fu & Clarke, 2018), whereas access to collective experiences of previous curriculum changes provided interviewed Swedish teachers with a broader repertoire to manoeuvre (Bergh & Wahlström, 2018).

### **Structural conditions**

*Effective school management and leadership.* This factor was mostly recognized as a contributor to teacher agency (Fu & Clarke, 2018; Poulton, 2020; Kneen et al., 2021). Accordingly, strong leadership shielded teachers from accountability and pressure to follow top-down system-developed materials (Poulton, 2020), provided resources (e.g., time, funding) for curriculum tasks (Kneen et al., 2021). In Fu and Clarke (2018), the role of the principal's leadership was highlighted. The principal in this study was described as effectively facilitating collective agency formation via continued encouragement and guidance; more importantly, his ability to maintain collective efficacy allowed the reform initiatives to be sustainable.

*Dynamic interactions among teachers and between teachers and the social structure through concrete curriculum activities.* At the school level, the willing involvement of all physics

teachers in a curriculum design activity in response to Chinese reform requirements showed how collective professional activities paved the way for agency (Fu & Clarke, 2018). In Kneen et al. (2021), cooperation among a group of Welsh pioneer teachers in building a curriculum framework illustrated how agentic engagement at the macro level could take place.

*Policy mediator support and outsider interventions.* As claimed by Ryder et al. (2018), policy mediators who act as brokers between policymakers and school communities could facilitate teacher agency. Besides, interventions from outsiders such as university researchers or teacher educators may encourage teachers to seek out and test alternatives (Willis et al., 2019; Scanlon et al., 2021).

However, several structural conditions were identified as limiting teacher agency.

*Contradiction between the new curriculum's tools and teachers' past experiences and beliefs.* In Bergh and Wahlström (2018), prescriptive knowledge objectives and continuous assessment were discovered to contradict with past collective experiences of teachers, therefore, constrained imagination of future teaching. In Fu and Clarke (2019), the conflict between reform mandates (e.g., student-centered approach) and traditional practices of college entrance examination required teachers to carefully negotiate between these two ends. In Poulton (2020), newly introduced summative assessment tasks contradicted many teachers' existing beliefs, limiting teaching decisions and preventing teachers from realizing their own aspirations.

*Lack of mechanism allowing flexibility.* "Contextual continuity, such as timetabling structures or planning routines that were seen as not able to be questioned" (p. 244) could create a constraining condition (Willis et al., 2019). Rigid timetabling was also confirmed by Kneen et al. (2021) as a main factor that might deactivate agency in curriculum reform.

*Lack of policy coherence.* Another constraining factor could be incoherence in reform implementation. Biesta et al. (2015) referred to this as "confused discourses encountered in schools" (p. 636) whilst Scanlon et al. (2021) uncovered a lack of assessment guidelines for teachers at the start of the implementation stage, leading to later anxiety.

*Lack of access to a wider professional discourse.* According to Biesta et al. (2015), "the absence of a robust professional discourse about teaching and education more generally" (p. 638) was likely to result in teachers' inadequate discourse to critically engage with the reform policy, thereby limiting their agency.

## **Cultural conditions**

*Collaborative and supportive school culture.* Positive professional relationships were widely claimed to enable teacher agency. Whereas supportive teacher-principal rapport facilitated teachers' exercise of curriculum autonomy at the school level, strong colleague relationships encouraged teachers to enact agency in the classroom (Min, 2019). Other studies confirmed that trust-based and respectful relationships with co-workers and school leaders were crucial to teacher agency in curriculum transitions (Fu & Clarke, 2018; Poulton, 2020; Willis et al., 2019). "Students' plasticity" (Fu & Clarke, 2019, p. 62), "student responsiveness" (Willis et al., 2019, p. 243), and "student engagement" (Scanlon et al., 2021, p. 57) were also sources of teachers' commitment to agency.

*Assessment culture.* Based on reviews of studies, it emerged that assessment culture did matter to teacher agency. Accountability culture with formal assessment pressure (e.g., high-stake exams, learning outcomes) may significantly limit teachers' agency as they are placed in a precarious position (Biesta et al., 2015; Fu & Clarke, 2019; Kneen et al., 2021; Poulton, 2020; Ryder et al., 2018; Scanlon et al., 2021). However, it also forced many teachers across contexts to learn how to balance local autonomy with external accountability (Bergh & Wahlström, 2018; Fu & Clarke, 2018).

## Discussion

As part of this scoping review, three questions were asked to better understand teacher agency in state-launched curriculum reforms, and discover conditions that support and impede such agency:

1. How is teacher agency conceptualized in the literature as it relates to large-scale curriculum reform in K-12 education?
2. How do teachers experience agency in their country's curriculum reforms?
3. What are the enabling and constraining conditions for teacher agency in the context of large-scale curriculum reform?

According to the results of this review, there is little clarity on the concept of teacher agency amidst reforms. Most of the research reviewed in this paper appears to have avoided defining teacher agency. Chisholm et al. (2019) also found similar results, and I agree with these authors that further studies should formulate an unambiguous definition of teacher agency. Moreover, the review shows a trend of combining different concepts and approaches to form the theoretical basis, which on the one hand means teacher agency is under-conceptualized and needs further theorization (Cong-Lem, 2021), on the other hand, signifies the complex nature of agency. Biesta, Priestley and Robinson's ecological perspective (Biesta et al., 2015; Priestley et al., 2013) dominated ten reviewed articles as the most dominant framework, confirming its popularity in teacher agency research generally (Cong-Lem, 2021). Although Cong-Lem (2021) advocated a unified framework to study teacher agency, I would recommend that, given the dynamic curriculum changes, scholars apply various theoretical frameworks to capture multifaceted aspects of teacher agency before attempting a better conceptualization of it. Notably, Scanlon et al. (2021) and Ryder et al. (2018) affirmed that agency appears to be a process rather than a product, which helps to theorize teacher agency. My suggestion is that future researchers consider viewing agency as a transformative process that occurs over time (Sannino, Engeström, & Lemos, 2016). A possible research idea is to explore how and under what conditions teacher agency emerges and transforms during different stages of curriculum reforms.

Regarding the second research question, teachers in all reviewed articles were found to have struggled with curriculum shifts. The explanation for the widespread stress teachers experienced will be discussed in conjunction with answers to the third question.

The most likely cause of teacher tension is the conflict between personal factors and structural and cultural forces. In the cases of Sweden, Australia, and Ireland, main contradictions occurred between neoliberal reform features (e.g., grading, national testing, prescriptive objectives, accountability) and teachers' autonomy (Bergh & Wahlström, 2018; Poulton, 2020; Ryder et al., 2018; Scanlon, 2021). In China, where exam-oriented tradition predates neoliberalism, the primary contradiction seemingly exists between imagined reform

intentions (e.g., student-centered approach, less workload) and real-life traditional expectations for teachers (performance in the competitive college entrance exam) (Fu & Clarke, 2018; Fu & Clarke, 2019). If left unresolved, *contradictions between the new curriculum's tools and teachers' past experiences and beliefs* might escalate into severe tensions, deactivate teachers' personal goals, limit teaching decisions, and constrain agency.

That is why *a collaborative school culture, dynamic interactions between teachers and the social structure through concrete curriculum activities, effective leadership, and a good assessment culture* can all help to support teacher agency. While professional support from the principal and other teachers is likely to assist teachers in transforming frustration into collaboration and creativity, an “assessment culture that acknowledges teachers' professionalism and student needs” (Poulton, 2020, p. 46) generates a safe environment for agentic teaching decisions. Therefore, in curriculum reform, principals are recommended to negotiate between policy messages, school realities, and social expectations, secure teachers from unreasonable external requirements, organize concrete curriculum activities for teachers to interact professionally with reform mandates, and build a trust-based collaborative school culture.

Tension and dilemmas can also result from contradictions among structural and cultural elements, such as those between school discourses (Biesta et al., 2015), between new pedagogical approaches and the current school structure (Kneen et al., 2021), and between official documents and implementation stage (Scanlon et al., 2021). Contradictions can also arise from a lack of coherence between policies at various levels (Poulton, 2020). This explains why, as previously stated, a *lack of policy coherence* and a *lack of mechanisms allowing flexibility* are regarded as constraining structural conditions for agency. For that reason, policymakers, besides school leaders, play an important part. They are advised to ensure coherence at all levels (Ryder et al., 2018), actively organize platforms for discussion, and set an action agenda involving stakeholders (Scanlon et al., 2021). Effective shared sense-making strategies across layers, as demonstrated in Finnish educational reform, are critical to the success of large-scale educational reform (Soini et al., 2021). Moreover, two studies in this review suggest that policy mediator groups connecting policymakers and practitioner communities could be established to support reform implementation (Kneen et al., 2021; Ryder et al., 2018), which accords with Priestley et al.'s (2021) suggestion.

Finally, contradictions might occur between different dimensions within personal factor. For example, in Biesta et al. (2015), teachers' inability to critically engage with reform discourses resulted from their own conflicting professional beliefs, whereas in Kneen et al. (2021), teachers' reluctance to change may have erected barriers to reform efforts. On the contrary, strong *professional beliefs* and *expertise*, as indicated in this review, *acted* as critical conditions that enabled many teachers to respond agentially “despite or perhaps *because of* the constraining conditions” (Chisholm et al., 2019). However, to overcome internal contradictions, teachers' efforts alone seem insufficient. Structural conditions such as *outsider interventions* and *access to a wider professional discourse* might be needed. Teacher educators and university researchers are strongly encouraged to collaborate with schools on reform implementation. Importantly, as suggested by Biesta et al. (2015), “access to robust professional discourses about teaching” (p. 638) should constitute a critical aspect of teacher education and continuous professional development.

## **Conclusion**

In conclusion, the findings indicate that diverse concepts and frameworks have been adopted in the reviewed papers to capture the complexity of teacher agency. It was also discovered that teachers experienced significant tension and demonstrated varying levels of agency across curriculum reform contexts. According to the literature, their exercise of agency was influenced by personal, structural, and cultural factors, with implications discussed above. It is important to note, however, that this review has two limitations. First, it relied solely on one research database, which might have limited the number of papers reviewed and may have resulted in selection bias. Secondly, it excluded valuable insights from non-English sources, which should be addressed in future reviews.

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***The Freirean Legacy in Innovative Educational Practices: Maker Culture, Active Methodologies, Digital Technologies and Transdisciplinarity***

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**Abstract**

Currently, the challenges of contemporaneity impose a new social contract for a fairer, more democratic and inclusive society. This idea implies a new vision of education and, consequently, a re(think) and innovation of school curricular practices with the purpose of contributing to the education of all citizens in this new era. In this context, we highlight the visionary Paulo Freire and the Maker culture, since the study presented here is part of a project to be developed in the scope of initial teacher training. Based on a reflection on the presence of Freirean thought in contemporary school curriculum proposals, which values inclusion, trans-disciplinarity and the natural integration of digital technologies supported by active methodologies, in this specific case the "hands-on" culture, this article aims to understand the concept of Maker Culture from the perspective of future teachers who will integrate the project. A questionnaire was applied to 23 students doing Supervised Educational Practice, integrated in two professional master's degrees. Two open questions were considered in this paper. The results show that most future teachers associate the concept with the constructivist paradigm in the sense of knowing how to do and create by the student using digital technologies, but also attribute an innovative nature that trains students capable of solving problems in an attitude of predisposition to the task with predominance of a collaborative environment and human value. We hope to contribute to a reflection on the training of future teachers in this new social framework of education.

Keywords: Maker Culture, Supervised Educational Practice, Initial Teacher Training

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## Introduction

We live in a globalized world and a networked society (Castells, 1999) characterized by the interactivity of semiotic resources directly influenced by the social context (Hodge & Kress, 1988; Kress, 2003) and by technological development. The integration of Information and Communication Technologies promotes new dynamics and identity strategies that promote a renewed teaching professionalism in the digital age (Nóvoa, 2013; Quadros-Flores, Peres, & Escola, 2013). From Moran's (2019) perspective, schools around the world are reinventing themselves and this is the time to develop educational practices that are aligned with the connected world we live in. To this end, it is necessary to break with pedagogical models that reproduce knowledge and with traditional disciplinary and fragmented curricula to move forward with proposals in which the curriculum connects with the world through digital technologies (Gonzaga, 2022). Thus, in this digital age, teachers are required not only the technical and pedagogical knowledge of the use of digital technologies, but also the creativity needed in the construction of educational practices that combine active methodologies and analog and digital resources, valuing transdisciplinarity and the development of knowledge, know-how, being and being indispensable for the critical awareness of students in solving everyday problems in a dialogical and humanized relationship with the world (Freire, 1983). The development of skills and competences in a motivating environment are fundamental factors for the success of the teaching and learning process, as advocated by Paulo Freire (1998), with the value of leaving no one behind (inclusion of all), and by Papert (1995), the result of a concrete action that results in a tangible product and that is of interest to those who produce it. Freire was an enthusiast for the use of technology in education, but pointed out, in a dialogue with Papert (Catholic University of São Paulo, 1995) that it should have the character of technological praxis since, in his view, technology humanizes men and makes them able to transform the world, and it is up to teachers to think of new ways to teach and learn, promoting opportunities for development and growth of students in different educational environments.

In this sense, it is necessary to institutionalize the actions for change, building systematic and conscious practices for the development of skills, abilities and attitudes in their students so that they can implement them, to be the protagonists, in the perspective of the three formative processes proposed by Pineau (1988, 2006a; 2006b): the self-training (formative action of the subject on himself), the hetero-training (formative action of other people in the subject's training) and the eco-training (formative action of the environment on the subject). The educator Paulo Freire believes, like Papert, that in this way technology can not improve the school, but it can destroy the oppressive school model, which unfortunately still remains in most of the reality, because considering that:

(...) we have tools at hand that amplify, facilitate, and stimulate the human cognitive faculties, so why not use them to amplify and/or modify the ways of teaching and learning? The educational processes can and must be contextualized in the information society, using the various resources that new technologies make possible in the educational field, whether in formal education represented by the school, or in education in the socio-community environment. Regardless of the place where learning takes place, whether in the formal or non-formal environment, we believe that this construction of knowledge mediated by the educator can and must rely on technologies to expand the possibilities of communication and interaction. (...) Modern technology serves as a mediator in the construction of the new teaching and

the new learning, but access to them must be guaranteed, and its use must be ensured within the concept of praxis, as proposed by Freire (...) (Soffner, 2019, p. 148-162)

In Freire's (1980, p. 82) line of thought "the educational process is the result of the communion of men, mediated by the world. As technology is part of this world, it can favor collaboration and interaction among men, as a praxis, generating a process of innovation in educational practices". And for this, it is necessary to prepare teachers, so that they can train the younger generations, and for this they must also develop digital literacy skills so that they can be in line with a school integrated in the digital society (Quadros-Flores & Raposo-Rivas, 2017; Raposo-Rivas et al., 2020; Graça et. al, 2021), so that they can develop values and attitudes of inclusion and sustainability in a heterogeneous environment of responsibility, equity and social justice. Involving humanity in the joint creation of futures, the new proposal of education today, according to UNESCO (2022), traces transformative lines of human societies and raises the student in the joint creation of knowledge, making him a thinking, responsible and autonomous producer. This perspective, also advocated by Freire (1983), emphasizes the idea that "nobody educates anybody, just as nobody educates himself: men educate themselves in communion, mediated by the world" (Freire, 1983, p. 79). As the subject of the learning process, the student assumes a central role and an effective posture, problematizing knowledge. In this sense, Japiassú (1979), Fazenda (1991), Klaassen (2018) refer potentialities of inter and transdisciplinary practices that favor dialogue, inter-help, epistemological curiosity, reciprocity, humility, involvement and commitment to projects and people, among others. Moran (2019) mentions that innovative schools combine three processes in a balanced way: personalized learning (learning the basics by oneself - prior learning, resulting in the flipped classroom); learning with different groups (peer-to-peer, networked) and learning mediated by more experienced people (teachers, counselors, mentors).

The concept of Maker Culture is associated with the idea advocated by Paulo Freire (1998), that education is a constant process of creating knowledge and seeking the transformation-reinvention of reality, by human action-reflection, which arises from the importance of the contextualization of knowledge and the student "putting his hand in the dough," which moves from "searching for the place to manufacture" to "one who manufactures anywhere" (Husinga, 2012). Students develop projects in which they use digital artifacts and other available materials to solve problems or produce significant knowledge for the community, adopting an interdisciplinary or transdisciplinary approach, propitiating dialogue between fields of knowledge, transforming the teacher into a learning designer (Bullock & Sator, 2015; Blikstein & Worsley, 2016; Rossi et. al., 2019; Sang & Simpson, 2019). Currently, the FabLab movement has created networks, such as the World Fab Foundation Network, in order to democratize access to the tools for technical invention and democratizing access to its benefits (Blikstein, 2017). In turn, the maker culture values creative learning, which goes through the construction of learning environments centered on 4 P's, based on the theory of Creative Learning developed at MIT Lifelong Kindergarten, linked to the Massachusetts Institute of Technology: (1) Projects (activities with problematization); (2) Playful thinking (free exploration, thinking playfully, with pleasure); (3) Passion (personal meaning, meaningful learning); (4) Peers (collaboration and respect, building teamwork, where the result tends to be much better, with exchanges, than if it were individually). He also guarantees four steps in learning: feeling, imagining, doing, and sharing, in a perspective of educational innovation. Freire also proposed two perspectives on innovation: as a regulatory action or as an emancipatory action:

That is why I reject banking pedagogy and propose and defend a critical-dialogical pedagogy, a pedagogy of the question. The public school that I want is the school where the critical apprehension of significant knowledge through dialogical relations has a prominent place. It is the school that stimulates the student to ask, to criticize, to create; where the construction of collective knowledge is proposed, articulating popular knowledge and critical, scientific knowledge, mediated by experiences in the world. (Freire, 2001, p.83).

Managing interdisciplinary curriculum, Maker educational spaces, emancipatory pedagogical practices, valuing student autonomy, their protagonism and the use of active methodologies, seems to us a necessary and viable alternative for educational innovation, in the perspective of praxis, recommended by Freire. In addition to Freire's idea of innovation in education, we consider Carbonell's (2002) perspective, defining it as:

A set of interventions, decisions, and processes, with intentionality and systematization that tries to modify attitudes, ideas, cultures, contents, models, and pedagogical practices and to introduce new curricular materials, teaching and learning strategies, didactic models, and other ways of organizing and managing the curriculum, the school, and class dynamics. (Carbonell, 2002, p.19)

In the context of teacher training, an intervention design was launched for Supervised Educational Practice, the EDUMAKER project - "Maker Culture in initial teacher training: a contribution to professional development", whose starting question aims to understand, from practices implemented in real contexts in the 1<sup>st</sup> and 2<sup>nd</sup> Cycles of Basic Education by future teachers, the impact on teaching professionalism: What is the contribution of Maker Culture, one of the pillars of Education 5.0, for professional development in initial teacher training? To answer this question the study aims to:

- Conduct a literature review in the context of Maker Culture;
- Investigate the theoretical basis of future teachers regarding the concept of Maker Culture including the bibliographic references on which they are based;
- Understand the methodological design used in the educational practice;
- To create a Maker Laboratory, supported by the Technical Scientific Unit of Mathematics, Natural Sciences and Technologies in order to promote the dialogue between future teachers and the use of fundamental technologies for educational practice;
- Foster the development of an interaction network between future teachers using different professional master's degrees and, therefore, enhance interdisciplinary dialogue and multiculturalism;
- To experience and analyze the projects created in the Maker lab for the change of educational practices;
- To verify the impacts of Maker practices on students from the 1<sup>st</sup> and 2<sup>nd</sup> Cycles of Basic Education;
- Understand Maker Culture as a transformer of the educational reality towards the common good;
- To identify the abilities, skills and attitudes developed by future teachers to understand Maker Culture as a transformer of the teaching professionalism;
- To encourage the participants to extrapolate the learning methodology experienced to other performance spaces, making them multipliers, researchers and evaluators of it;

- To encourage the production of scientific research in the field/area of the project;
- Produce scientific articles from reflective reports about the experiences provided by the project;
- Encourage future teachers to commit to the Sustainable Development Goals (ODS), developing, from them, investigative themes from interdisciplinary curriculum projects, at different grade levels, using the Maker methodology and different technologies.

We assume that transformative teaching practices necessarily involve a combination of active methodologies and digital technologies and are meaningful to the actors in education. In this context, teachers become facilitators of personal and group learning itineraries, true designers of collective learning with their students and educational agents. Methodologies emphasize the leading role of the student, enriched by a hybrid model, responding to all students and circumstances in an environment of flexibility, sharing spaces, times, activities, materials, techniques and technologies (Moran, 2015). The project aims for the future teacher to become more empowered, a digital citizen, builder and facilitator of knowledge, environments and interactions. That they become a researcher of reality, an innovative designer of their educational practices, a computational thinker, a creative communicator and a global collaborator, assuming a unique responsibility in the training of new generations: no teacher will be able to develop experiences that they have never experienced, so it is important to develop these practices from initial teacher training.

This article is part of the reflections and investigations of three researchers and teacher educators, seeking to contribute to a project for the initial training of elementary school teachers at a public Portuguese university, the Polytechnic Institute of Porto, by building the proposal of a training curriculum based on innovative curricular practices, aiming to prepare future teachers for an Education 5.0.

We are in its initial stage, and, as part of the initial diagnosis of one of the project's development contexts, we applied the survey by questionnaire to students in initial teacher training of two professional master's degrees about Maker Culture, the methodological basis of the training project we seek to mobilize. Thus, this article aims to understand the concept of Maker Culture and Education for innovation from the perspective of future teachers, and the results will serve as a starting point for the development of the formative process of future teachers.

### **Methodological options**

As mentioned, this article is part of the EDUMAKER project, which aimed to understand how future teachers conceive the concept of maker culture. To this end, the following research question was outlined: What are the conceptions of students in initial teacher training about the concept of maker culture?

Following a quantiquitative methodology, we applied an online questionnaire survey (Ghiglione & Matalon, 2001), with open and closed questions, to 23 future teachers who attend the Supervised Educational Practice, integrated in two professional master's degrees. The participants were mostly female.

For the analysis of quantitative data, we used descriptive statistics to describe and summarize a set of data. The qualitative data were analyzed using content analysis techniques from

Bardin's (1977) perspective, using the "mileage" procedure, in which the categories of analysis are created as the data are analyzed, and each category is only defined at the end of the operation.

### Analysis and discussion of the results

In the present paper, only some questions from this survey will be analyzed: "Have you heard of Maker Culture?"; "In what context have you heard of it?"; "What do you consider to be Maker Culture?"; "What elements do you consider to be necessary for the development of Maker Culture in the classroom?"; "In your opinion, what is an Education for Innovation?".

We asked the prospective teachers if they had ever heard of maker culture (Figure 1).

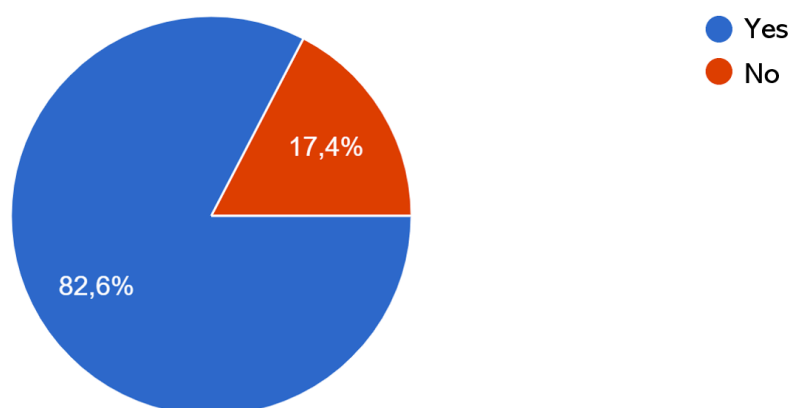


Figure 1: Student responses to the question: "Have you heard of Maker Culture?"

It was found that 82.6% of the students said they already knew the term "Maker Culture", which shows some contact, theoretical or practical, with other ways of teaching and learning. Only 17.4% said they had never heard of the term, a negligible percentage, but which points to a reflection within the scope of initial teacher training.

We wanted to understand in what context they had heard of the term, so we put options to answer and also an option that allowed them to choose freely.

The students' responses are mirrored in the following bar chart (Figure 2).

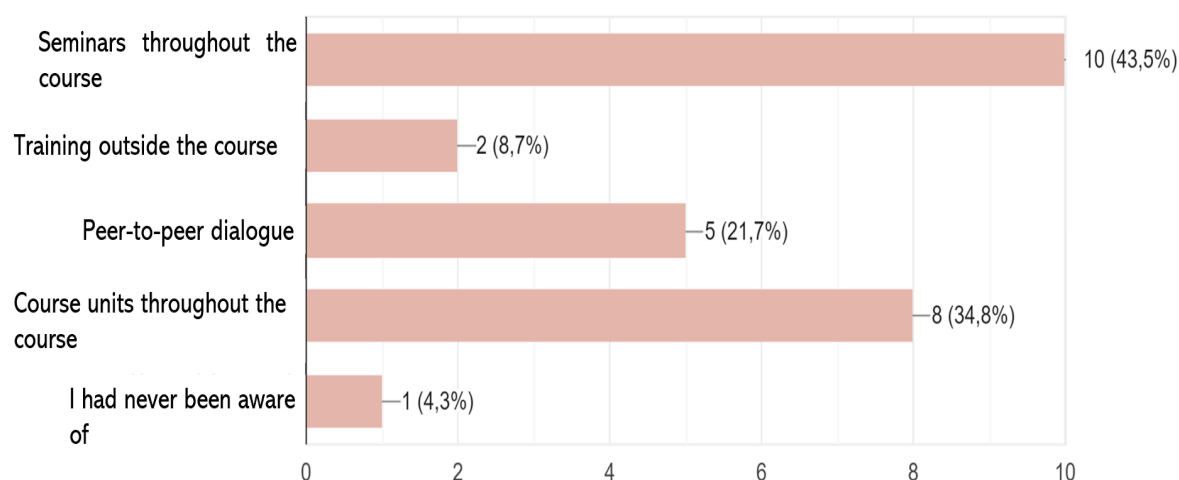


Figure 2: Students' answers to the question: "In what context have you heard of it?"



It was found that 43.5% of the students have been exposed to the term through seminars throughout the course, offered by their teacher training institution. These seminars are mainly focused on Supervised Teaching Practice. Already 34.8% consider in "Curricular units along the course". Note that in the 3rd year of the Degree in Basic Education, in the Initiation to Professional Practice III: Observation and Cooperation in Educational Contexts (IPPIII) students are 80 hours in internship situation in real contexts. It is also noted that only 21.7% selected the option "dialogue among colleagues", which is a fundamental aspect in the training process of future teachers that is based on a paired training process, marked by teamwork, collaboration and cooperation supported by key moments of reflection and action research. In any case, the result shows that the concept is discussed or developed in initial teacher education.

We also questioned the future teachers in initial training about their concept of Maker Culture. As it was an open answer, it was categorized as follows (Table 1).

Analysis Categories	Analysis Descriptors	Total occurrences
Use of digital technologies	Answers that consider the use of digital technologies as maker culture.	2
Educational practices based on constructivist paradigms	Answers that consider the maker culture as the opportunity to put the student at the center of his learning process, making him active in the construction of his learning, through "learning by doing".	15
Learning method/strategy	Answers that consider maker culture a learning strategy and method.	6

Table 1: Students' answers to the question: "What do you consider to be Maker Culture?"

A high number of occurrences, the majority (15), places the concept of Maker Culture in educational practices designed in a constructivist paradigm, and the answers show the opportunity to place the student at the center of his learning process, making him active in the construction of his learning, through "learning by doing": "A creative and proactive methodology that gives body to verbs like experiment, create, think, do." [a6]; "Taking matters into one's own hands. Being a principal party in the knowledge process." [a13]; "The creation of one's own technological objects and resources." [a17]; "I think the maker culture motivates students to build their own knowledge, to set their own goals, and to work autonomously to achieve them." [a3]; "The student learns through practice." [a21].

The six responses that conceive Maker Culture as a Learning Method/strategy show that as a pedagogical strategy it develops skills in the student of creativity, critical and creative thinking: "A way of sharing and creating ideas and knowledge." [a16]. The two responses associate the concept of Maker Culture with the use of digital technologies: "I think it is a culture that is based on the idea of creative construction, meaning people are able to turn their ideas, projects, etc. into reality, through technology among others." [a2]. Although the concept is not limited to the use of digital technological resources these are fundamental in a

global connection and reveal potentialities in prototyping and creating products and in ecological sustainability, besides developing skills inherent to the 21<sup>st</sup> century.

We sought to better understand what elements students feel are necessary for the development of Maker Culture in the classroom. The responses are mirrored in the word cloud below. In the word cloud, the size of the words is directly proportional to their frequency in the text (Figure 3).



Figure 3: Students' answers to the question: "What elements do you think are necessary for the development of Maker Culture in the classroom?"

The words "Technology", "Creativity", "Other materials", "Critical thinking", "Sharing", "Dialogue" stand out as key elements considered by future teachers to carry out Maker Culture practice in the classroom. It is found that future teachers associate Maker Culture practice with characteristics of the student profile in the 21st century (Oliveira-Martins et al., 2017): "Proactivity, critical thinking, group and individual work." [a7]; "Openness on the part of teachers and creativity on the part of students." [a5]; "Technology, group work, critical spirit." [a10]; "Creativity, commitment, dedication." [a18].

It is expected that future teachers, by acquiring knowledge about the important elements for the implementation of Maker Culture in the classroom, will be able to mobilize them in their educational practice in order to find a methodology capable of embracing ICT in an integrated, critical and, eventually, innovative way (Graça, Quadros-Flores, & Ramos, 2020).

Finally, we questioned the future teachers: In your opinion, what is an Education for Innovation? The answers are categorized in the following table (table 2).

Analysis Categories	Analysis Descriptors	Total occurrences
<b>Use of digital technologies</b>	Answers that consider the use of digital technologies as a fundamental aspect for an innovative education.	5
<b>Active construction of your knowledge</b>	Answers that consider the use of active learning methodologies, which place the student as the active builder of knowledge, as a fundamental aspect for an innovative education.	13
<b>New teaching and learning strategies/methodologies/new conception of education</b>	Answers that refer to the need to adopt new teaching and learning strategies/methodologies for an innovative education. In addition, they refer to a new conception of education aimed at Freirean thinking.	8
<b>21st Century Skills</b>	Answers that consider the development of 21st century skills essential for innovative education.	3

Table 2: Students' answers to the question: "In your opinion, what is an Education for Innovation?"

Of the four categories, the one related to "Active construction of their knowledge" is the one most highlighted by future teachers, considering that educating for innovation requires the use of active learning methodologies relevant to the focus on the student as the active constructor of their knowledge: "It is an education that seeks to provide students with the best learning, allowing them to build their own knowledge, therefore betting on innovation." [a2]; "In my opinion, it is an education that prepares students for change and allows them to build their own knowledge" [a9]; "It's an education where the student feels like the center of learning." [a16].

In their answers, the future teachers also focus on the category "New strategies/methodologies of teaching and learning/new concept of education", which shows that educating for innovation requires changes in pedagogical and organizational renewal, and in the concept of education itself. We emphasize that the new concept of education also goes in the direction of Freirean thought: "It is targeted teaching, where the student has access to innovative tools that bring elements of meaningful learning with new practices." [a7]. "It's about building teaching that is creative, inclusive, and increasingly responsive to students' needs." [a14]; "It is an education that aims to transform and renew." [a17].

The use of digital technologies is also verified in five responses as fundamental to education for innovation: "An education that uses technology and allows the student to be to make decisions regarding their own learning." [a11]; "For me it focuses on developing skills to build a more competent being in society." [a12].

## Conclusion

Regardless of how the innovation process is carried out, developing practices of educational innovation implies an attitude of planned change with the purpose of providing capacity to the organization, institution or system and educational actors to meet the objectives that motivate the innovation itself. Thus, educational innovation can be understood as the search for answers to the challenges present in the dynamics of school processes, from the analysis and critical reflection and creative thinking of the sociocultural context, for effective

contributions that such innovations can offer in the process of learning and personal and social formation. We know that the current challenges focus on a humanistic and sustainable paradigm that promotes the education of citizens and professionals for a VUCA world - Volatility, Uncertainty, Complexity and Ambiguity. Paulo Freire, an avant-garde pedagogue who, since the 1960, has been building pedagogical, political, ethical, and epistemological bases for the renewal of the school, considers, according to Carbonell (2002), the need for a curriculum that aims at the transformation of the culture of the collective subject through the awareness of social reality, emancipating those involved and transforming reality.

In this reality Maker Culture, mediated by technologies and by an inter and trans disciplinary knowledge approach, responds to the commitment of Agenda 2030 (UNESCO) with its Sustainable Development Goals (ODS). Note that, education for the common good is a social commitment to shape sustainable futures grounded in social, economic, and environmental justice (UNESCO, 2022), which means that it prepares for future changes by highlighting knowledge, skills, attitudes, and values, as reinforced by the current curriculum (DL n° 55 de 2018). From this perspective, education is a commitment to human capabilities that interact using Science in a cultural environment. Maker Culture responds to private and public interests and includes all citizens, because everyone is capable of putting their hand in the dough by making, according to their curiosities, interests and needs, towards the common good. It integrates the citizen actively, in a pedagogy of autonomy and liberation in the process of construction and sharing that, using technologies, creates products as an answer to common problems and needs, so important in an era of change where innovation takes significant shape in personal and social success. It thus awakens the spirit of meaningful learning in a contextualized, empathetic and entrepreneurial challenge.

The results of this study show that initial teacher education is beginning to respond positively to change. Future teachers know the concept of Maker Culture and associate it with pedagogies that actively center the student in the learning process by developing 21<sup>st</sup> century skills that use varied and updated technologies, especially digital ones, as a response to the development of personal and social skills towards the common good. Among personal abilities, creativity and critical thinking are relevant in the process of innovation and creation. As far as social skills are concerned, collaborative dialogue with others is equally relevant. These two points underscore the perspective of the public school dreamed of by Paulo Freire. The study also shows that educating for innovation involves three significant dimensions: (1) a constructivist environment in the learning process; (2) pedagogies that develop skills for the 21st century; (3) integration of digital technologies. We hope to contribute to a reflection on the concept of Maker Culture in the training of future teachers in this new social framework of education.

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***Challenges and Potentialities of Using ICT in Initial Teacher Education:  
A Comparative Study With Students From Portugal and Spain***

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**Abstract**

The use of digital technologies in a conscious, critical and creative way is one of the challenges proposed in initial teacher training, since we are witnessing a time of change that requires the preparation of future teachers for the 21<sup>st</sup> century. This article is part of the IFITIC Project which aims to rethink educational practice with ICT in the initial training of future teachers in order to promote methodological renewal in preschool education and in the 1st and 2nd cycles of basic education. The study involves 111 students, from two Higher Education institutions in the North of Portugal, attending Degree in Basic Education and Professional Masters in teaching. It also involves 40 students from a Spanish College of Education. The aim is to know the thoughts of future teachers, regarding their technical and pedagogical knowledge in the curricular integration of Information and Communication Technologies (ICT). This is a quantitative study whose questionnaire survey included open and closed questions. For the open questions we used the content analysis proposed by Bardin (1977). The results show a) the reasons that promote the integration of technologies in the practices; b) the type of activities performed with students; c) the factors that inhibit the use of technological resources in educational practices. The study concludes that the reality experienced by Portuguese and Spanish future teachers is similar. With this study we hope to contribute to a reflection on initial teacher training.

Keywords: Digital Technologies, Initial Teacher Education, ICT Attitude

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## Introduction

We are experiencing a time of social, economic and technological revolution, often referred to as the Knowledge and Digital/ Information Era (Castells, 2002), which has opened new possibilities in education that promote a new teaching professionalism (Nóvoa, 2013; Quadros-Flores & Raposo-Rivas, 2017). In a changing framework, the school assumes an institutional commitment to educate integrating principles of a digital and networked society, manifested in new and different ways of communicating, interacting, reflecting and intervening (Gallego-Arrufat & Raposo-Rivas, 2016), new ways of learning and teaching how to learn (Arends, 1995). The new reality influences the initial teacher education that must respond with renewed methodologies and updated analogical and digital resources, so it imposes new scientific, technical and pedagogical knowledge in initial teacher education, as well as other skills to meet the challenges of today (Quadros-Flores, 2016). In this sense, initial teacher education is currently a space of opportunities for experimentation with renewed practices, which facilitate the responsible use of ICTs in an integrated and critical way, and the development of skills, attitudes and values that are relevant today (Graça, Quadros-Flores & Ramos, 2020).

There are several existing guidelines for the development of educators' digital competence in Europe. One of them is the DigCompEdu Framework (Redecker, 2017), which is oriented towards teacher training policies aimed at the digital proficiency of teachers. With the aim of supporting educational practices based on the active involvement of students in the teaching and learning process, mediated by digital technologies, it is divided into six areas focused on different aspects of educators' professional activities (Figure 1).

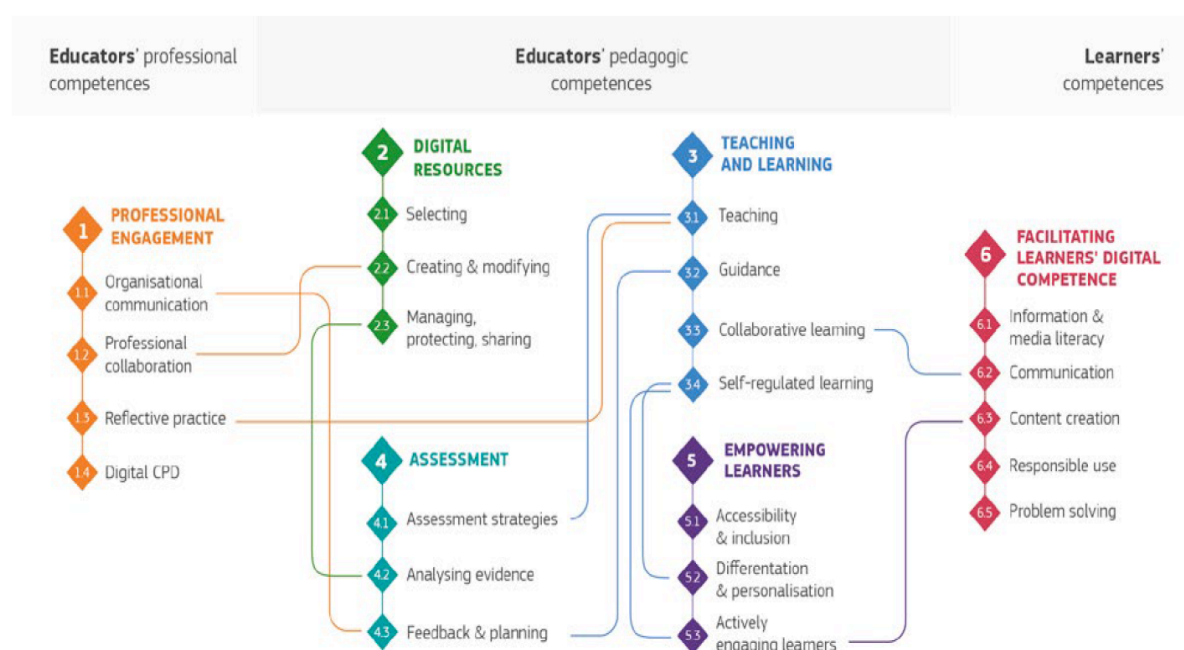


Figure 1: Educators' competences in DigCompEdu

Areas 1 and 2 refer to the educator's digital pedagogical competence which should be based on efficient, inclusive and innovative teaching and learning strategies. Anchored in the specific steps of any teaching process, mediated or not by digital technologies, are areas 1, 2 and 3, where area 2 refers to the planning process; area 3, to the moment of implementation and assessment; area 4, to teaching and learning; area 5, to the use of digital technologies in

teaching and learning strategies centred on the learner; and finally, area 6, which encourages learners to use digital technologies creatively and responsibly for information, communication, content creation and others. These competences are related to the progression model presented in this framework, which assumes helping educators to understand their strengths and weaknesses, systematising different levels of digital competence development (Figure 2).

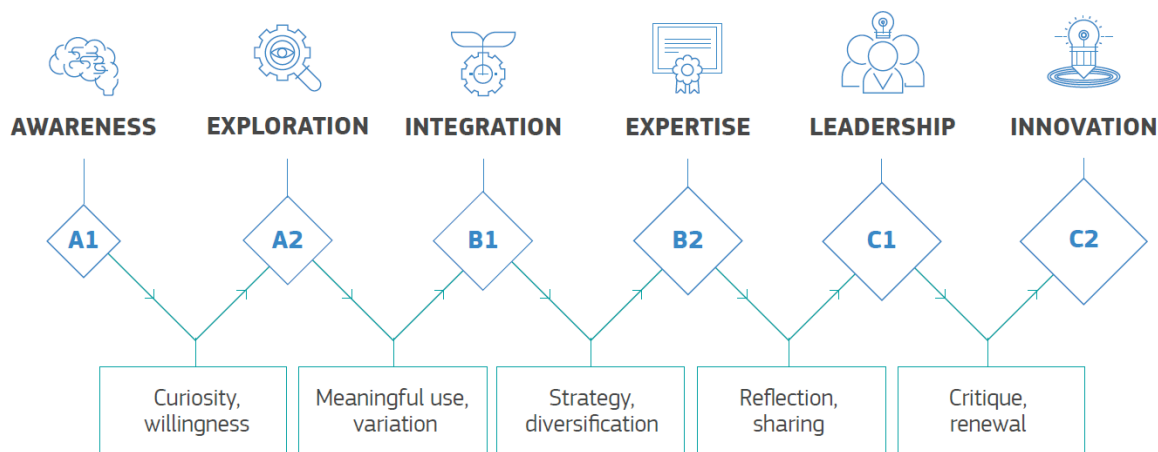


Figure 2: DigCompEdu Progression Model

The first two phases (A1; A2) require teachers to assimilate new information in order to develop their digital practices. The next two phases (B1; B2), foresee the teacher applying, deepening and reflecting on digital practices to reach the last two phases (C1; C2), which are the most complex of the process and which aim at transmitting their knowledge, criticising their practices and developing new practices (Redecker, 2017). These skills are fundamental in changing educational practices and, consequently, in renewing the teaching professional identity in the digital age (Quadros-Flores & Raposo-Rivas, 2017). The TPACK (Technological Pedagogical Content Knowledge) model meets these guidelines, since it advocates the combination of content, pedagogical and technological knowledge in a dynamic and interconnected way (Figure 3).

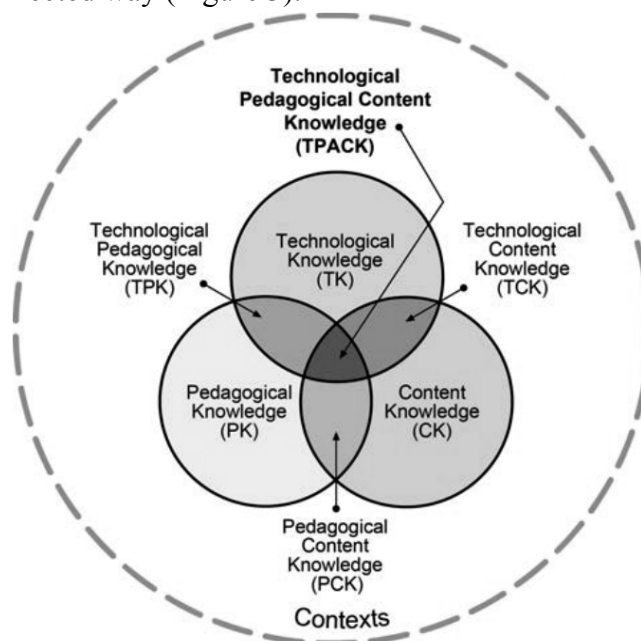


Figure 3: TPACK model

This model, created by Mishra and Koehler (2006), based on Shulman (1986), includes three main dimensions of knowledge: content (teacher's knowledge about curriculum content); pedagogy (teacher's knowledge about the teaching and learning processes: strategies, methods); and, finally, technology (technological knowledge and the ability to mobilize it in their educational practices). Several authors, such as Sampaio and Coutinho (2014), JaipalJamani and Figg, (2015) emphasize the importance of using this model in initial and continuing teacher education, as they consider it to be a training model that favours the construction and professional development of teachers.

These two references are relevant in this study because of the guidelines that promote the effective integration of ICT in educational practices. Within the scope of initial teacher education, it is important to know the knowledge of future teachers in the implementation of educational practices with ICT, three of which are highlighted in this article. The study of Graça et al. (2021) investigated the potential and knowledge of future teachers and concluded that there are factors that inhibit the integration of digital resources in educational practices and other drivers of such practices. The research of Raposo-Rivas et al, (2020) found that during this training period there is little creative and interactive use of technological resources, as well as the practice of innovative and active methodologies in real contexts. Finally, the study by Fonseca (2020) sought to investigate the training practices developed using ICTs in initial teacher training, finding difficulties in providing opportunities for future teachers to observe and experiment with the pedagogical uses of digital technologies.

In this sense, the teacher should use technology combined with active teaching methodologies based on social constructivist theories that advocate the student as an active, participatory and constructor of their own learning (Moran, 2018). Gamification, Project Based Learning, Problem Based Learning, Peer Instruction, Flipped Classroom, Just-in-Time Teaching, Design thinking and others (Silva, 2020) are some of these active methodologies, however, we highlight a pedagogical approach "From them to them: when processes become products and again processes" (Quadros-Flores et al, 2019) by combining three important steps in the learning process: the Flipped Classroom in the "prepare-do" in an individual way outside the classroom and Storytelling in the "do-tell" collaboratively in the classroom, where the student investigates, selects and collects information, uses doing together and learns, evaluates.

We know that in initial teacher training the development of innovative educational practices are conditioned by the availability and quality of technological equipment present in educational settings. In Portugal, the Ministry of Education (2020) has developed an Action Plan for Digital Transition "Digital Training of Teachers", to be implemented, which focuses on the development of teachers' digital skills necessary for teaching and learning in this new digital context. To this end, the Directorate General for Education (DGE) articulates with the Training Centres for School Associations (CFAE) the development of this initiative through a set of activities, including training workshops on 3 levels of digital proficiency. This plan is articulated with the European Framework of Digital Competence for Educators.

In Spain, the Ministerio de Educación y Formación Profesional (2022) in collaboration with the Autonomous Communities published the updating of the reference framework for teaching digital competence to adapt it to the evolution of digital technologies and their educational use. This framework is coherent with regional, state and European proposals on digital competences to guide the ongoing training of teachers and facilitate the development of a digital culture in the classroom. It is used as a tool for the design of their educational

policies in order to improve the digital competence of teachers to contribute to the acquisition and development of students' skills and to the proper functioning of educational centres.

### Methodological options

This is a quantitative-qualitative study in which an online questionnaire survey (Ghiglione & Matalon, 2001) with open and closed questions was applied to Portuguese and Spanish future teachers who are in initial teacher training, namely in the Degree in Basic Education. The study involves the School of Education of Porto, the University of Minho and the University of Vigo, therefore the survey was collaboratively constructed, validated by a group of students from the different higher institutions. However, the responses of future teachers from Portugal and Spain were carried out in different media. The figures below show the number of responses. A total of 151 students responded, of which 111 were Portuguese students and 40 Spanish students.

The survey is divided into three parts: one part relates to the student's personal and academic information; another focuses on the availability of ICT resources by the student and internship centre; and the third part aims to collect detailed information on attitudes towards ICT, knowledge and use of ICT in educational practices. For the analysis of quantitative data, descriptive statistics were used to describe and summarise a set of data.

### Analysis and discussion of the results

In the present work, only some questions from this questionnaire survey will be analysed, performing a comparative analysis of the data from Portugal and Spain: What are the main reasons that lead you to use technologies in your professional life; What kind of activities do you do with your students; What digital resources are available?

The first question aimed to investigate the reasons that lead future teachers to integrate digital technologies into their educational practices. The answers for the case of Portugal (P) are in Figure 4, and for the case of Spain (E) are in Figure 5.

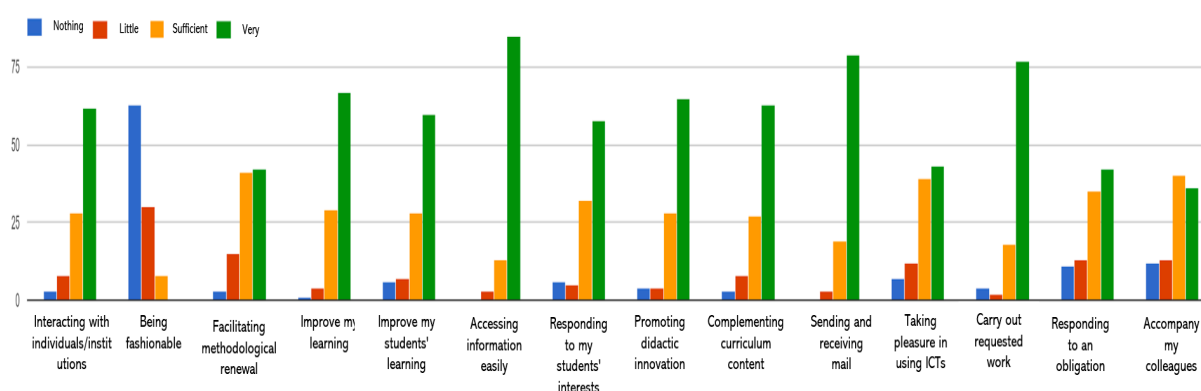


Figure 4: Responses to the question - "What are the main reasons that lead you to use technologies in your professional life?" (Portugal)

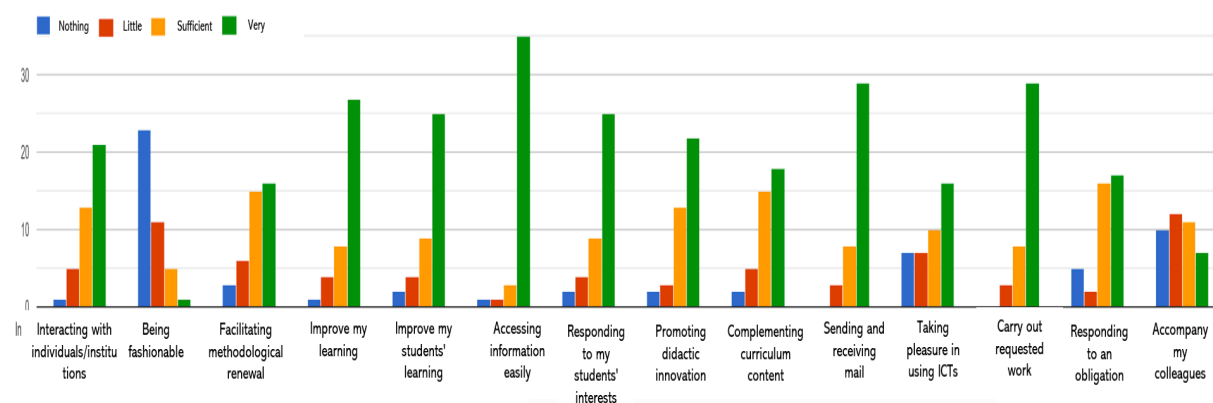


Figure 5: Responses to the question - "What are the main reasons that lead you to use technologies in your professional life?" (Spain)

Visually the two figures reveal similarities, despite the different percentages. In general, it can be seen that the majority of Portuguese and Spanish future teachers use digital technologies in their practices to "Access information easily" ( $P=76.5\%$ ;  $E=87.5\%$ ); "Send and receive mail" ( $p=71.1\%$ ;  $E=72.5\%$ ); "Carry out requested work" ( $P=69.3\%$ ;  $E=72.5\%$ ); "Improve my learning" ( $P=60.3\%$ ;  $E=67.5\%$ ) and "Promote didactic innovation" ( $P=58.5\%$ ;  $E=62.5\%$ ). In Portugal the majority, in Spain almost the majority, assume as motivation "Complementing curriculum content" ( $P=56.7\%$ ;  $E=45\%$ ). The least significant reasons in the countries under study are: use by "Being fashionable" ( $P=0\%$ ;  $E=2.5\%$ ); "Accompany my colleagues" ( $P=32.4\%$ ;  $E=17.5\%$ ); "Facilitating methodological renewal" ( $P=37.8\%$ ;  $E=40\%$ ); "Taking pleasure in using ICTs" ( $P=38.7\%$ ;  $E=40\%$ ); "Responding to an obligation" ( $P=37.8\%$ ;  $E=42.5\%$ ).

The results show that most of the future teachers assume attitudes of a citizen in the information age, using digital spaces to communicate and access information relevant to their personal and professional lives. Also, as future professionals, most of them feel the need to recreate the pedagogical practice and complement curricular contents. We highlight that the current curriculum also involves curricular flexibility (DL n.º 55 of 2018) and refers to significant learning and methodologies that value interdisciplinarity and transdisciplinarity, so the result is understandable. The educational intentionality in the use of ICTs should also be highlighted, since future teachers do not use them because it is a fashion, few to accompany their colleagues or to respond to an obligation.

We wanted to understand what activities future teachers propose to their students by integrating ICT (Figure 6).

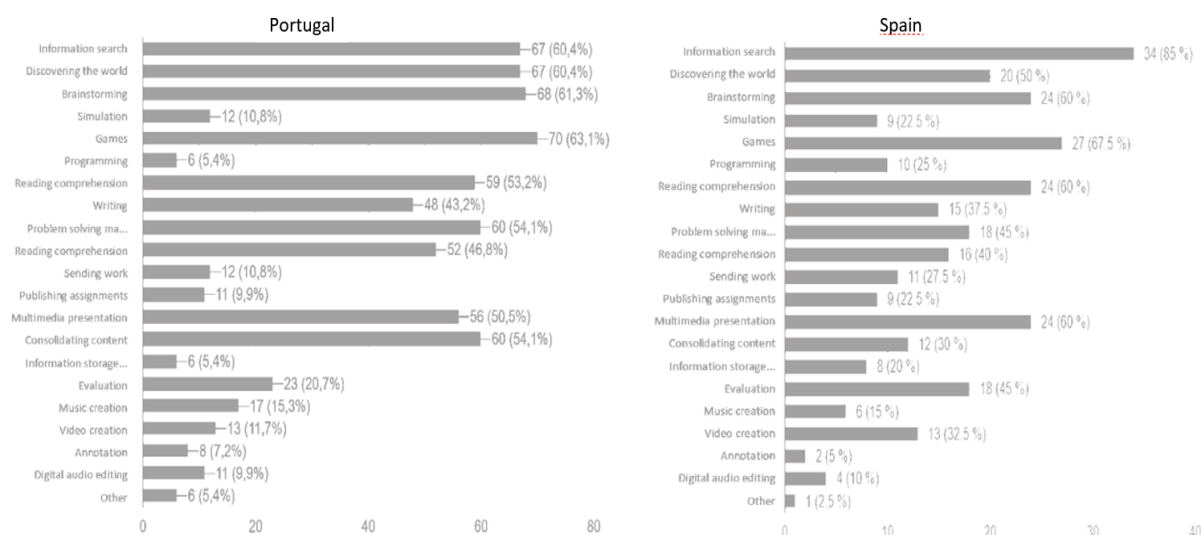


Figure 6: Responses to the question - "What kind of activity do you do with your students?" (Portugal and Spain)

Figure 6 reveals that most of the teachers carry out the same type of activities, although the percentages are different: use of "Games" (P=63.1%; E=67.5%), "Access to information" (P=64%; E=85%), "Discussion of ideas" (P=61.3%; E=60%), "Multimedia presentation" (P=50%; E=60%), "Understanding the world" (P=60%; E=50%). Still in Portugal, the majority perform "Mathematical problem solving" (P=54%; E=45%) and Consolidating contentedly (54.1%; E=30%). In the case of Games, according to Vygotsky (1998), the imaginary situation, or the assumption of make-believe, is a strategy that involves the child in the activity, developing multiple capacities in the scope of creation, decision and relationship, and it also contributes to the expansion of conceptual abilities. On the other hand, access to applications that promote comprehension activities is also fundamental, and there are applications that favour the schematic image of the understanding of the text, the visualisation of the whole and the parts, as is the case with conceptual maps.

Similarly, there are similarities in the type of activities less developed with ICT by the future teachers in the two countries (although with different percentages): "Simulation" (P=10.8%; E=22.5%), "video editing and creation" (P=11.7%; E=32.5%) and "music" (P=15.3%; E=15%), "Publishing assignments" (P=9.9%; E=22.5%), "Programming" (P=5.4%; E=25%), "Information storage" (P=5.5%; E=20" and "Annotation" (P=7.2%; E=5%).

Figures 7 and 8 reveal the digital resources most used by Portuguese and Spanish prospective teachers in their educational practices.



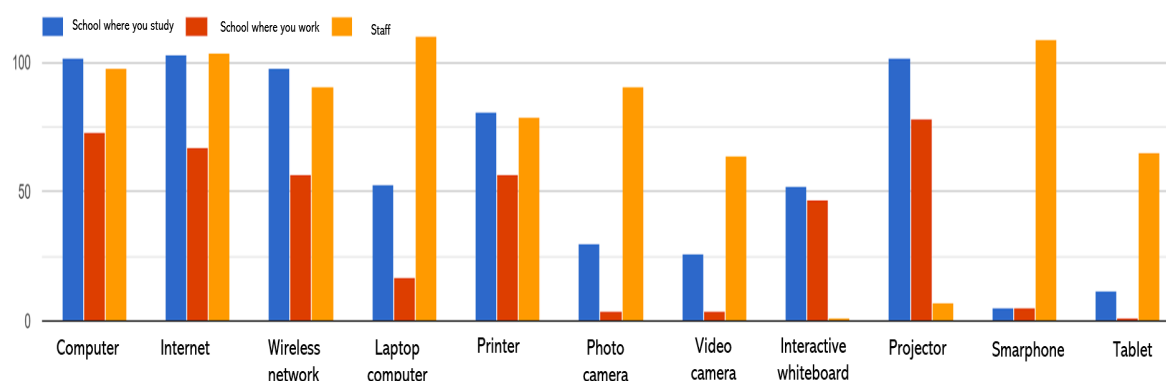


Figure 7: Responses to the question - "What digital resources are available?" (Portugal).

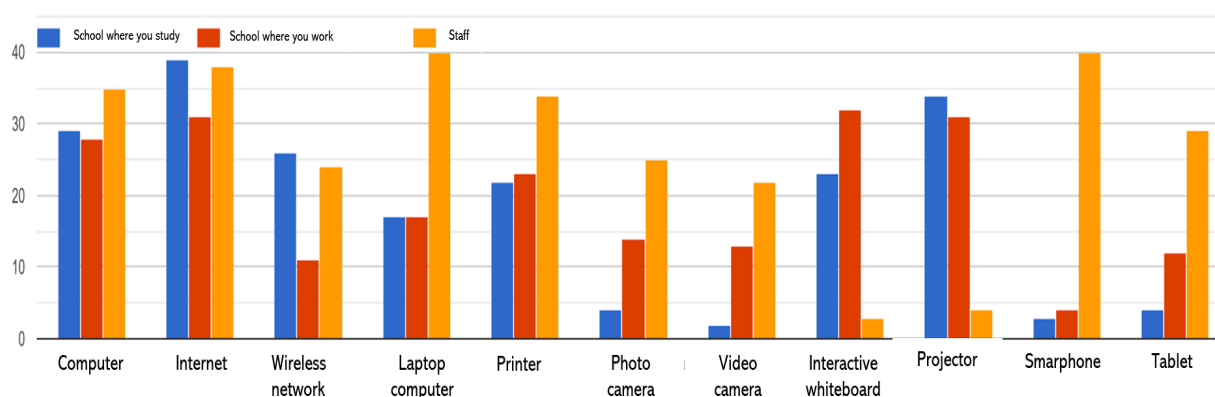


Figure 8: Responses to the question - "What digital resources are available?" (Spain).

Although with differences in percentages, overall the result is equivalent. Thus, it can be seen that the resources most used by future teachers in the two countries in the study are the student-in-training's own, private ones. They have tools which make them autonomous in accessing information and communication (Smartphone, Tablet, laptop, tools which include video and photo cameras). But they do not have basic tools that are found in classrooms, these are offered in a higher percentage by the Higher Education Institutions and in a lower percentage by the Training Centres where the Supervised Teaching Practice takes place: Computer, Internet, Wireless Network, Projector, Interactive Board and Printer.

## Conclusion

Certain that initial teacher training is a key moment in the beginning of the construction of teaching professionalism, that develops throughout professional life, in a dynamic process of construction of the teaching professional identity, we wanted to know the thoughts of future teachers regarding their motivations and technical and pedagogical knowledge in the integration of Information and Communication Technologies (ICT) in educational practices.

The analysis of the results leads us to conclude that, despite some differences in percentages, in general there are no significant differences in the opinion of future teachers in Portugal and Spain. Thus, the motivations for the use of ICT by future teachers are mainly due to personal and professional development reasons: learning to be in order to better teach to learn. Future teachers show that they are preparing themselves to be a digital professional, one who uses technology responsibly, ethically and with respect for others, so they do not use it because it



is fashionable or because others use it. They demonstrate autonomous skills in the construction of professional knowledge, thanks to the potential of new technologies to access information and applications that support the teaching and learning process. The activities referred to escape the banking paradigm, as designed by Paulo Freire (1985) and stimulate student activity, although multimedia presentations may consolidate this paradigm if not used with active pedagogies. They reveal some pedagogical knowledge, although they show some weaknesses, namely in simulation, programming, video and music creation and editing, etc.

With regard to the resources used, there seems to be a trend for educational institutions to offer resources that facilitate the student's personal or collective use of digital technologies, such as the computer, the wireless network and the interactive whiteboard. In this sense, the student uses his personal resources in the learning process. It is noted, however, that higher education institutions are better equipped with resources that facilitate the use of other technologies in the teaching and learning process than the Training Centres.

Aware of the limit of the study, we hope to contribute to a reflection on initial teacher training, given that we believe that technology, when integrated in a pedagogical and ethical way, resizes teaching professionalism aligning it to the culture of the third millennium with new dynamics and identity strategies that give meaning to change (Quadros-Flores & Raposo-Rivas, 2017).

### **Acknowledgments**

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## ***Gen Z College Students, COVID-19 Courses & Beyond***

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### **Abstract**

The pandemic thrust the usage of Learning Management Systems, LMS, on teachers in all levels of education. Some students and faculty, especially at the college level, were experienced in using it but many were not prepared to the degree needed when schools were forced to go online. This paper reviews undergraduate Generation Z (born after 1996) opinions and experiences of positive learning effects from doing coursework with an LMS and their eagerness to continue with flexible online educational supplements. A small case study of Human Resource students compares perceptions of Academic Year (AY) 2020-2021 with online synchronous courses and AY 2021-2022 with in-person courses.

Keywords: Canvas, COVID-19, Gen Z, LMS, Online

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## Introduction

The 2020-2021 academic year was extraordinary and unprecedented for teachers, staff, administrators, and students. Announcements/changes on testing, safety protocols, and restrictions became the norm. Students adapted to hybrid classes with half the students meeting on campus for certain days and online for others; entire classes that could fit students with appropriately distanced space in lecture rooms; online WebEx or Zoom synchronous lecture classes; or totally online asynchronous courses. The mixture was sometimes confusing; there could be internet access problems, or computer, sound, and/or camera glitches. Students also had a patchwork of teachers; those who could navigate the technology and the Canvas learning management system (LMS) or those who lacked experience despite years of offered training that continued into Spring 2020. By 2021-2022, the vaccine enabled campus courses, though masked until March. This paper reviews some of the COVID-19 school-year issues and reports on a survey of two courses in Spring 2021 and two courses in Spring 2022 of business students' opinions of their experiences with online learning.

## The COVID-19 College

Major changes to the classroom setting were forced by the pandemic and perhaps there was some good in it. The pedagogy of lecturing to captive students for over an hour and quizzing them on the contents every few weeks has been questioned as a productive way to learn (Barsoti, 2020). Online LMS systems, often unused by many faculty before COVID-19, allowed students to ask questions on chat lines; respond to presentations with emojis and/or comments; and view recorded lectures. There is a concern for adequate connectivity on and off-campus, as well as technical skills, more so for faculty than students. For schools with their LMS in the cloud, it can remain available to students and faculty even if there is a system breach like that at Brown University in March 2021 (Brown, 2021). LMS enabled sustainability for education during the pandemic (Alturki & Aldraiweesh, 2021). Using LMS for classes is not new but it is now expected.

## LMS Usage

Just as new technology has enhanced the entertainment industry beyond CDs and cable tv, so too can the constructive usage of the LMS and technical tools boost students' learning and interest in courses as it can "reimagine an old model that has fallen behind the times" (Smith, 2020). Keeping students engaged will be critical as the high cost of education, which increased 154% in 20 years (Fong, 2020), could make consumers question the need for a campus experience if online is a credible, less expensive option. Incorporating the excitement and flexibility of capable online learning with enriching campus activities will be essential to retaining student populations.

The design of online course material should be done with consistency and simplicity. Assignments, places for uploads, and example materials should be found through a clear path. "Keeping your home base simple decreases cognitive load and increases working memory" (Schroder, 2020). The students need to see the online component as a complement and a learning aid to their courses. According to the Technology Acceptance Model by Davis (1989), ease of use and perceived usefulness can be critical components of successful education incorporating technology.

## Recent Studies

The Sykes company, a customer engagement service, surveyed 1500 college students about their fall 2020 semester with some or all coursework online due to the pandemic. An important finding was that over 85% felt they learned just as well in the online class format and only 14.2% did not during this time of challenge for their learning (Figure 1) (Pike, 2021).

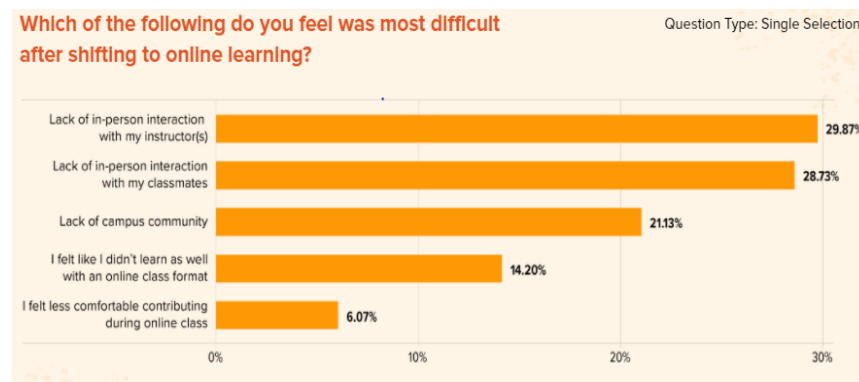


Figure 1. Source: Sykes Survey 2020 (Pike, 2021).

Of this population, 45% wanted more support to develop virtual collaboration skills with their classmates and 44% wanted more support for tech issues during class (Pike, 2021). Despite a strong need for more support, remarkably 54.2% of students felt the online experience was somewhat or much more effective (Figure 2) (Pike, 2021).

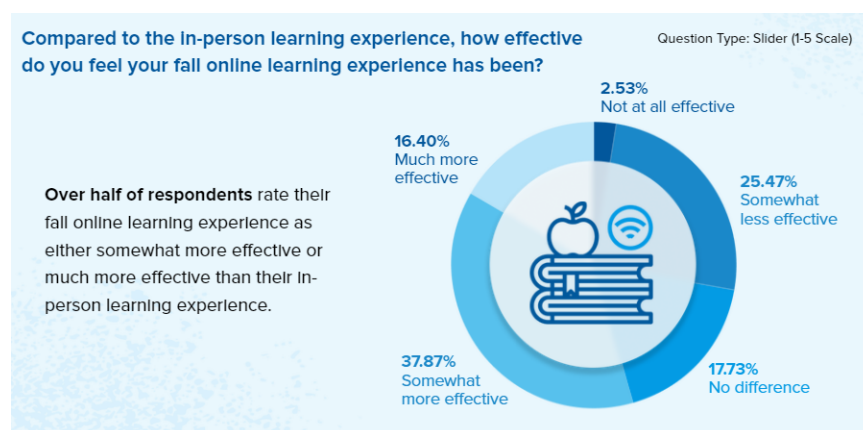


Figure 2. Source: Sykes Survey 2020 (Pike, 2021).

A 2006 survey of 4538 Australian university students who used Blackboard reported expectations for higher quality design, more usage among teachers, and improved consistency across courses. They liked access to PowerPoints and other course material but felt more training was needed for teachers who underutilized the LMS and were the cause of navigation problems in the course (Steele, 2007).

In a study published in 2022, a sample size of 370 students using the LMS Moodle, found that 100% strongly agreed/agreed that they felt comfortable using Moodle and that it helped the learner become active in the learning process (Bawa, Imam & Bello, 2022).

## Survey Results

In Spring 2021, students in two synchronous online undergraduate courses were surveyed on their experiences and perceptions of usage in Canvas. All 40 respondents were Gen Z: 10 were 18-19; 27 were 20-21; and; 3 were 22-23. Canvas was highly favored by students such as strongly agree/agree by 100% who would want course material in Canvas; 97.5% that having accessible feedback was beneficial; and 97.4% would like teachers to have assignments in Canvas. Although over 90% of students agreed/strongly agreed that teachers could use Canvas well, 80% felt teachers could improve the course content; 82.5% thought teachers should have more material available; 94.9% would prefer reading teachers' feedback in Canvas; and 97.5% who want teachers to have clear assignment dates in it (Appendix A).

In Spring 2022, students in two on-campus undergraduate courses with the same extensive Canvas elements were surveyed on their experiences and perceptions of Canvas. All 39 were Gen Z: 6 were 18-19; 27 were 20-21; 6 were 22-23.

Responses of strongly agreed/agreed of 2022 – 91.3% and 2021- 92.5% were received on how Canvas “has increased my understanding of the course material”; 2022- 92.2% and 2021- 95% noted “chapter quizzes in Canvas helped to understand the topics”; 2022- 94.8% and 2021- 90% stated it was “easy to access course material” and 2022- 96.4% and 2021- 97.5% appreciated that “PowerPoints were good guides to chapter topics” (Appendix B). This opinion of the LMS as an assistance to learning reinforced the larger previously noted Australian study.

As to preferences in the delivery of the class, in the 2022 small focus study, fewer students stated preferences for completely online, but many still wanted a combination of online and on-campus courses, 2022 – 46.2%; 2021- 52.5%, (Figure 3).

all students present class style preference	2021 N=40	2022 N=39
completely on-campus course	32.0%	37.3%
a 2-day a week course that meets 1-day on-campus and 1-day online	35.0%	32.2%
completely online course	17.5%	9.7%
occasional online class but mostly on-campus	17.5%	19.0%

Figure 3. Undergraduates' choice for method of classes.

The average time spent on a course in Canvas was 3-4 hours per week (2022-50%; 2021- 40%); 5-6 hours for 2022-10.5%; 2021- 30% of students (note some 2021 students attended synchronous classes in Canvas though outside of course time was clarified for the item); 2022-29% and 2021-20% claimed 0-2 hours; and 2022-10.5% and 2021-10% declared more than 6 hours of Canvas usage per course. This related to the question about studying on a regular basis with a 2022-18.9%; 2021-20% response that it was very characteristic to do so; 2022-51.4%; 2021- 42.5% characteristic of them (the average); 2022-21.6%; 2021-27.5% moderately characteristic; and 2022-8.1%; 2021-10% not characteristic at all to study on a regular basis.



## Conclusions

The case study surveys reinforced previous results of the benefits to learning using the LMS in courses as reported by students. The usage can allow for more activities in class by, for example, taking a chapter quiz before the class that aids in understanding the material (Nicholas, 2019). It is certainly a message for faculty to incorporate this pedagogical tool into courses. Educators should always be proponents of continuous learning for themselves as well as students. Advancing knowledge in subject matters and methods of communicating to foster understanding is an ongoing challenge and a mission of pedagogy. Technological tools including calculators and computers have enhanced education and the Learning Management System is an innovation needed for today's courses.

Michael Smith (2020) professor of information technology and marketing at Carnegie Mellon observes “We have a chance today to reimagine an old model that has fallen far behind the times. If we do it right, we might even usher in a new golden age of education.” There can now be an advanced amalgamated practice for instruction (Peters, 2021).

On a social justice level, education could be “much more open, inclusive, and available and allow people who'd previously been excluded to participate” (Barsoti, 2020).

Institutions of higher learning “have a once-in-a-generation chance to reconfigure their use of physical and virtual space. They may be able to reduce the number of large lecture halls, for example, and convert them into flexible working pods or performance spaces. Or they could reimagine the academic calendar, offering instruction into the summer months” (Dua, Law, Rounsaville, & Viswanath, 2020). Innovation encompasses “recognizing that no institution can be successful and sustainable without placing students' success at the center, which includes understanding how and why to equitably incorporate technology into learning and the student experience.” (Grajek, 2022). So much is possible; teachers need to embrace the constructive methods of the LMS.

## APPENDIX A

Opinion of teacher usage of Canvas.	STRONGLY AGREE		AGREE		DISAGREE		STRONGLY DISAGREE	
	2021 N=40	2022 N=39	2021 N=40	2022 N=39	2021 N=40	2022 N=39	2021 N=40	2022 N=39
many teachers use it well	25.6%	30.8%	64.1%	61.5%	10.3%	7.7%	0.0%	0.0%
many teachers have slides and/or papers accessible in it	40.0%	46.0%	55.0%	48.7%	5.0%	2.7%	0.0%	2.7%
many teachers have quizzes/exams in it	47.5%	46.2%	47.5%	51.3%	5.0%	2.6%	0.0%	0.0%
I would like teachers to have course material such as slides, example papers, quizzes in Canvas	67.5%	74.4%	32.5%	25.6%	0.0%	0.0%	0.0%	0.0%
I would like teachers to have assignments in Canvas	69.2%	72.5%	28.2%	27.5%	0.0%	0.0%	2.6%	0.0%
I would like teachers to have clear assignment dates in Canvas	77.5%	74.4%	20.0%	25.6%	2.5%	0.0%	0.0%	0.0%
many teachers could improve their course content in Canvas	32.5%	32.5%	47.5%	50.0%	20.0%	17.5%	0.0%	0.0%
I would like more course material accessible in Canvas	45.0%	41.0%	37.5%	48.7%	17.5%	7.7%	0.0%	2.6%
many teachers use the edit papers/feedback in Canvas	25.6%	35.9%	64.1%	48.7%	7.7%	7.7%	2.6%	2.6%
many teachers recorded the class meetings	22.5%	15.0%	50.0%	32.5%	25.0%	35.0%	2.5%	17.5%
I prefer reading the teacher feedback in Canvas	30.8%	47.4%	64.1%	50.0%	5.1%	2.6%	0.0%	0.0%
taking into consideration the differences in course material, it would be helpful to have consistent basic templates in Canvas	42.5%	55.3%	52.5%	36.8%	5.0%	5.3%	0.0%	2.6%

## APPENDIX B

Responses about using Canvas.	STRONGLY AGREE		AGREE		DISAGREE		STRONGLY DISAGREE		NOT OFFERED		NEVER USED	
	2021 N=40	2022 N=39	2021 N=40	2022 N=39	2021 N=40	2022 N=39	2021 N=40	2022 N=39	2021 N=40	2022 N=39	2021 N=40	2022 N=39
has increased my understanding of the course material	42.5%	51.3%	50.0%	41.0%	5.0%	5.1%	2.5%	2.6 %	0.0%	0.0%	0.0%	0.0%
easy to access course material through modules	40.0%	65.8%	50.0%	29.0%	10.0%	2.6%	0.0%	2.6%	0.0%	0.0%	0.0%	0.0%
PowerPoints were good guides for chapter topics	37.5%	48.7%	60.0%	48.7%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	2.5%	0.0%
sample papers in course were helpful	55.0%	61.5%	37.5%	35.9%	2.5%	0.0%	2.5%	2.7%	0.0%	0.0%	2.5%	0.0%
assignment dates were clear	40.0%	61.4%	45.0%	35.9%	12.5%	0.0%	0.0%	2.7%	2.5%	0.0%	0.0%	0.0%
chapter quizzes in Canvas helped to understand the topics	37.5%	61.4%	57.5%	30.8%	5.0%	5.1%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%
uploading papers is preferred to print	62.5%	74.4%	27.5%	20.5%	7.5%	0.0%	0.0%	2.6%	2.5%	2.6%	0.0%	0.0%
virtual team area is useful	17.5%	30.8%	52.5%	41.0%	12.5%	12.8%	7.5%	7.7%	2.5%	2.6%	7.5%	5.1%
liked viewing grades	67.5%	69.2%	32.5%	28.2%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%	0.0%
having accessible feedback was beneficial	65.0%	64.1%	32.5%	33.3%	0.0%	0.0%	2.5%	2.6%	0.0%	0.0%	0.0%	0.0%
exams on Canvas were better than on paper	61.5%	74.4%	30.8%	20.5%	5.1%	2.6%	2.6%	2.6%	0.0%	0.0%	0.0%	0.0%
enjoyed using breakout rooms	23.1%	25.6%	56.4%	30.8%	10.3%	15.4%	5.1%	15.4%	5.1%	0.0%	0.0%	12.8%
connectivity is sometimes a problem	22.5%	15.4%	57.5%	33.3%	17.5%	35.9%	0.0%	10.3%	2.5%	0.0%	0.0%	5.1%
I feel confident using/accessing material in Canvas	47.5%	68.4%	47.5%	29.0%	5.0%	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%	0.0%
for	5.0%	10.3%	20.0%	20.5%	45.0%	33.3%	15.0%	18.0%	2.5%	2.6%	12.5%	15.4%

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***Investigating Formative Assessment Strategies to Support Differentiation via  
Digital Technology in Elementary Math Classes***

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**Abstract**

In this study we investigate how digital technologies can support educators' differentiation and students' learning through formative assessment (FA) strategies. A three-dimensional assessment framework is developed via a European project FaSMEd (2022) by eight experienced elementary teachers, familiar with digital technology, who received instructions (and support) for FA mathematics strategies. Five FA strategies were used to invest differentiation and assess how digital technology facilitated the following FaSMEd strategies: (1) clarify and sharing learning intentions; (2) enhancing effective classroom discussions and participating in learning tasks; (3) providing feedback to students; (4) activating students as instructional resources; (5) activating students as the owners of their own learning (Thompson & Wiliam, 2007). Eight in-service teachers observed student behavior in their math classes via three codings, (1) sending and sharing; (2) processing and analyzing; (3) providing an interactive environment, in the five FA strategies. We explored to what extent does digital technology supported teachers' differentiation and students' learning by using a qualitative observation checklist and interviewing teachers. We found that digital technology can function as a support for enhancing and increasing classroom discussions and participation in learning tasks. Through digital technology, teachers proved more effective as facilitators, provided more and better feedback to students and extended the use of learning resources. Students initiated more meaningful mathematics discussions and showed increased ownership of learning tasks.

**Keywords:** Formative Assessments, Differentiation Strategies in Mathematics, Technology Integration

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## Introduction

Researchers have identified differentiated instructions as a primary indicant of effective instruction (Alshareef, et al., 2022; Standford, et al., 2010); in fact, the ability to individualize instruction-based student variability demonstrates one of the largest effect sizes in educational research. For this reason, differentiated instructions play a primary role in performance-based assessments of educators (Ruchniewicz & Barzel, 2019). The investigation of our practice as teacher educators leads us to concur with the importance of helping teachers develop the set of skills associated with instructional individualization.

In this study, we perform a comprehensive literature review investigating what we see as the crucial nexus between the teaching process with formative assessments and the effective employment of digital technologies used in the elementary math classes. Because of the centrality of assessments in producing effective differentiation (Thompson & Wiliam, 2007), comprising the core of individualization, we concentrate on the teaching process observation with five formative assessment aspects that will predict the ability of elementary math teachers to best select support technology. We implemented the FaSMEd (Aldon et al., 2015) framework to investigate how digital technology can support educators' differentiation and students' learning performance.

## Formative Assessment Strategies

Formative assessment (FA) strategies may have different concepts between the U.S. and the European countries. FA may be defined as "the process used by teachers and students to recognize and respond to student learning in order to enhance that learning, during the learning." (Bell & Cowie, 2001, p. 540). U.S. prefers to use "informal assessment" (Boston, 2002) to describe students' on-going performance. In this study, formative assessment strategies provide different processes of teaching and learning with evidence collected from teachers' checklists. From the checklist report, we are looking for the level of using technology in the process of teaching and learning.

In recent years, especially with the impact of COVID striking the world, digit technology used in educational approaches have become a popular trend in the U.S. According to Breiner et al. (2012), technology involves "the replacement of traditional lecture-based approaches" (p 3). While researchers focus on how digital technology can be used in the current classroom, seldom has research explored if the digital technology can effectively help teachers' differentiation and students' learning performance. The purpose of this study is to investigate to what extent digit technology can support teachers and students in processing 4-week math units. To do that, five formative assessments in the FaSMEd project provide five different process aspects. In this study, we investigate how digital technology can facilitate the on-going processes of the five aspects.

## The Meaning of Differentiation

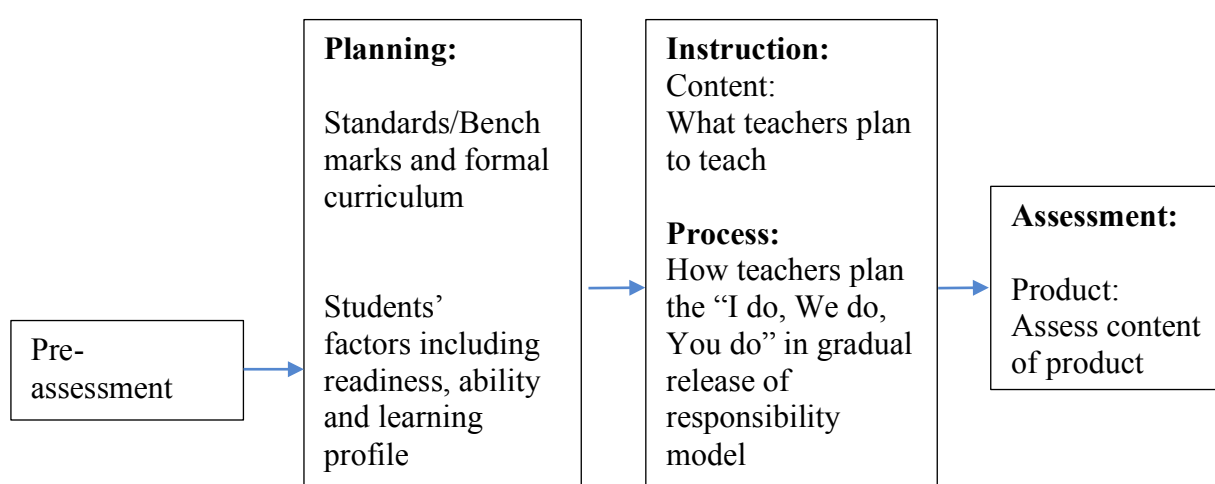
The common term differentiation is introduced by Tomlinson (2001) to meet the needs of individual or small groups of students. Overall, five different types of differentiations (Tomlinson & McTighe, 2006; Tomlinson & Allan, 2000, Mann & Willis, 2000, Reis et al., 2011) may determine students' needs of readiness, interest, and learning style. The types of differentiation may be differentiation of content, process, and product (Tomlinson, 2001). In addition, differentiation of affect can refer to learners' feelings about the learning task and



themselves. Differentiation of learning environment may be related to individual, small or large group learning, learning task with or without technology, or learning in face-to-face, online (synchronous or asynchronous learning), or hybrid instruction.

Figure one represents a learning cycle and teachers' decision factors in differentiation instruction. It may include pre-assessment, planning, instruction, and assessment. Eventually, the aim of differentiated instruction is to enhance different students' learning ability in the same class.

**Figure 1.** Learning cycles and decision factors used in planning and implementing differentiated instruction



(Adapted from Oaksford & Jones, 2001)

The study emphasizes the process of differentiation from traditional classroom settings to see how technology can facilitate teachers' differentiation instruction and students' learning performance. Especially, in the instruction section, teachers use the gradual release of responsibility model "I do, We do, You do" (Fisher & Frey, 2008).

### Curriculum-based Assessment as Relevance

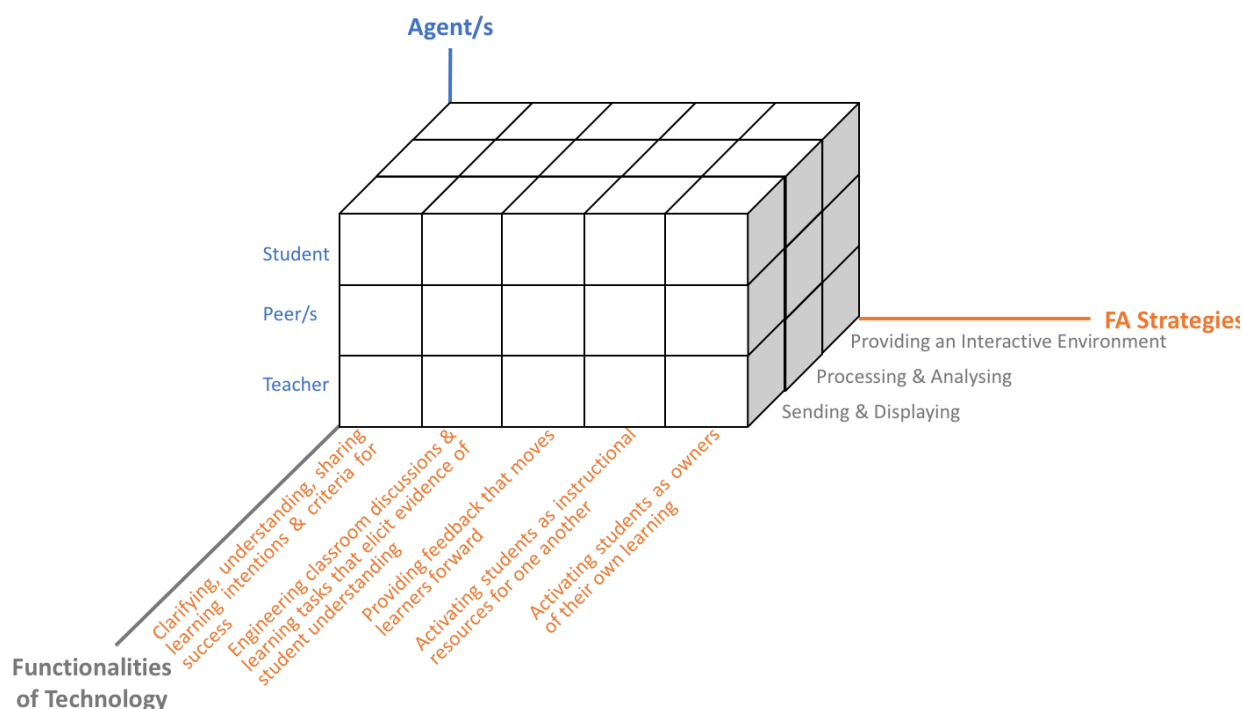
The concept of curriculum-based assessment (CBA) was used in understanding the level of teachers' and students' performance with the curriculum (Hinze, et al., 2006). Table 1 represented teachers' roles and students' responses during the curriculum process. Under the process of instruction, CBA play the role to describe teachers' and students' performance in lessons. The formative assessments investigate how digital technology can support the differentiation for students.

**Table 1.** The Curriculum-based Assessment Levels

	Teacher's role	Students' performance
Level 0	Knowing students' needs	Demonstrate level of current understanding
Level 1	Present new knowledge correctly	Demonstrate they understand the new knowledge in the whole class interaction
Level 2	Walk around and observe students' performance (find errors and think why)	Apply new knowledge in a project-based, problem-based, or research-based model Students work together to teach each other, peer-assess each other in their group
Level 3	Listen to students' group presentation Discuss with students (ask students how to get the answer) Share errors from observation Summarize the class performance	Present their project or right answer Learn from other students' errors Receive teacher's feedback Take summery from teachers

### Formative Assessment in FaSMEd

Figure 2 represents five Formative Assessment (FA) strategies showed in Science and Mathematics Education (FaSMEd) three-dimension framework.

**Figure 2.** The FaSMEd framework

*Note.* Adapted from Aldon, Cusi, Morselli, and Sabena (2017)

Three dimensions include Agents, Functionalities of Technology, and FA strategies. Agents may include students, peer/s, and a teacher which are the three factors. Functionalities of Technology may include digital technology used in three aspects, which are Sending & Displaying, Processing & Analyzing, and Providing an Interactive Environment. The five FA

strategies are showing in the following on-going teaching process by first stage: Where the learner is going, the second stage: Where the learners is right now, and the third stage: How to get there. Figure 3 represents the five FA strategies within the three stages with the role playing of teacher, peer(s) and learners.

**Figure 3.** Deriving the five key strategies of assessment for learning

	Where the learner is going	Where the learner is right now	How to get there
Teacher	1. Clarifying learning intentions and criteria for success	2. Engineering effective classroom discussions, questions, and learning tasks that elicit evidence of learning	5. Providing feedback that moves learners forward
Peer/s	Understanding learning intentions and criteria for success	3. Activating students as instructional resources for one another	
Learner	Understanding learning intentions and criteria for success	4. Activating students as the owners of their own learning	

*Note.* Adopted from Thompson and Wiliam (2007)

In this study, we imbedded FaSMEd's five formative assessments to the gradual release of responsibility model (Fisher & Frey, 2008) of I do, we do, you do and closure (See figure 4) to see how technology can facilitate teacher's differentiation and student's learning performance. Under this model, all teachers observe what level of digital technology can be used in the five FA.

**Figure 4.** Transfer FaSMEd to graduate explicit model

I do: 1. Clarifying learning intentions and criteria for success	We do: 2. Engineering effective classroom discussions, questions, and learning tasks that elicit evidence of learning	You do: 3. Activating students as instructional resources for one another  4. Activating students as the owners of their own learning	Closure: 5. Providing feedback that moves learners forward
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*Note.* Adopted from Fisher and Frey (2008).

## Methods

### Participants:

Eight 4<sup>th</sup>-grade in-service teachers participated in the study. They had between 24-27 in their own classroom. The eight in-service teachers were in three different elementary schools, located in central Minnesota of the U.S. They were looking for the level of digital technologies to support teacher's differentiation instruction and students' learning performance in elementary math lessons. The eight teachers had the experience to

differentiate their math lessons by using digital technologies. Data collection mainly included in-service teachers' classroom observation with a checklist. Five formative assessments strategies, implemented in FaSMEd (Thompson & Wiliam, 2007) were transferred to be five observation points in each lesson process which checked what levels of digit technology were used in math units (see Appendices A).

### Research Question:

To what extent, can digital technology support teachers' differentiation and students' learning in elementary math classes? The data were collected by three codings related to digital technology used for 1). sending and sharing; 2) processing and analyzing; 3) providing an interactive environment (FaSMEd, 2022) in the five FA strategies. The data were analyzed by qualitative observation and an interview in grounded theory to investigate if digital technology can be used in advanced levels to facilitate teachers' differentiation instruction and students learning needs in elementary math units. The eight in-service teachers were familiar with the gradual release of responsibility teaching model (Fisher & Frey, 2008). They taught math units (polygon, place value, and fraction computations) in math class over a duration of 4 weeks.

### Process of the Study and Data Collections:

#### *Stage One:*

**Pre-assessment of students:** Eight in-service teachers used their students' standardized test data (MCA II math test, showed in Table 2) to know each student's math performance and know each student's strength and weakness of mathematics in their last academic year (3<sup>rd</sup> grade). On average, each classroom has 2-3 IEP students, 16-22% of students' math performance below average, and 70-75% of students were performing on average. Based on the data set, 8 in-service teachers designed different math learning tasks for different students.

**Table 2.** Pre-assessment of this study (Students' standard test)

Fourth grade teachers	Students' 3 <sup>rd</sup> grade math performance		
	Above average (%)	Average (%)	Below average (%)
Teacher 1	10	73	17
Teacher 2	9	75	16
Teacher 3	14	70	16
Teacher 4	6	75	19
Teacher 5	8	71	21
Teacher 6	6	74	20
Teacher 7	12	71	17
Teacher 8	8	74	18

**Design digit technology integrate in 4-week math units:** Eight in-service teachers are familiar with the gradual release of responsibility model (Fisher & Frey, 2008). They distributed the five FA strategies using the process of "I do, We do, You do and Closure" (see Figure 3 above) in their math lessons. Learning activities represented in the "We do" and "You do" sections of the lessons had students grouped together using different kinds of

technology (e.g., iPads, laptop, computer, or smartboards) to explore knowledge, to do game-based activities, or to take pictures of hands-on projects.

### ***Stage Two:***

**Implementation of the 4-week math units:** The eight in-service teachers in this study did not let their 4<sup>th</sup> graders know there was research being conducted during their lessons. As usual, they began their math lesson following I do, We do, You do, and Closure process. The differences included digital technology in their differential instructions. For example, smartboards were used as interactive tools (with students' iPads) not only to present what new knowledge is but also use game-based digital technology (e.g., Kahoot, math games in iPads) to clarify students' level of understanding, which may reach FA first strategies: clarifying learning intention. In the "We do" and "You do" portion of the lesson, students used iPads to work on math projects or play math games, which may reach FA second strategy: Classroom discussion. With students working in groups, teachers walked around with their iPad to collect students' mis-concepts, pattern of errors, and facilitate their misunderstanding, which met FA third strategy: Activating students as instructional resources for one another, FA fourth strategy: Activating students as the owners of their own learning, and slightly FA fifth strategy: Feedback to students by teachers/technology. In the closure portion of the lesson, teachers shared their observation of students' performance with the class and then wrapped up a lesson. Students took iPads home to finish their homework and turned their homework in to Schoology, an online management system used by schools. Teachers provided feedback and graded students' papers in Schoology, allowing students and parents to monitor work. After that, teachers could make a review game using technology or summarize what they have learned in the beginning of next day's lesson. This process reached FA fifth strategy: Feedback and Summary of what students learned. Feedback to students played an important role to facilitate students in "We do" "You do" and "Closure" portion (Hattie & Temperley, 2007).

**Observation checklist:** During the whole teaching process, teachers filled out their observation checklist (See Appendix A) to report to what extent teacher and students used digit technology during the math lessons. The checklist is one part of data collection in this study.

### ***Stage Three:***

**Interview questions:** After the 4-week math lessons, each in-service teacher accepted an interview individually conducted by researchers. The main interview questions were:

- How does digital technology support differentiation in teaching?
- How does digital technology support feedback for students?
- To what extent does digital technology support students in exploring new knowledge-especially in their group projects?
- To what extent does digital technology support your students to present their projects?
- To what extent does digital technology help you provide feedback to students and make meaningful class summaries for students?

## Data Analysis:

Descriptive statistics may represent eight in-service teachers' checklists. It may show how frequently digital technology tools (Smartboards, iPads, technology-based online games, and Schoology) were used in "I do", "We do" "You do" and "Closure" which represented the on-going teaching process with FA 5 strategies in math lessons. Interview questions explored eight teachers' perspectives in using digit-technology in their differentiated instructions for different math level students. Those questions also explored to what extent digital technology can support their teaching and students' learning.

## Findings and Conclusions:

### *Eight In-service Teachers' Checklist Report:*

The findings showed digital technology plays a big role in processing and analyzing in the FaSMEd five aspects, especial in "We do" portion (FA second strategies) of enhancing effective classroom discussion and "You do" portion (FA fourth and fifth strategies) of ownership and teamwork in learning tasks. Eight teachers provided compelling evidence that they can enlarge students' rich discussions when students are allowed to get online through their iPads to explore some math topics (e.g., the meaning of polygon, the different ways to do two digits multiplication, the fraction concept etc.) and bring back to the class to share what they found. Figure 4 shows their favorite technology tools used in their lesson process using "I do, We do, You do, and Closure."

Overall, Digital technology (e.g., Smartboard, iPads, online games, and Schoology) provided the resources for teachers to differentiate their traditional teaching process to better address different students' needs. Technology can be used to record, collect, and check students' understanding and clarify students' learning intention for the next day.

**Figure 5.** Eight in-service teachers' checklist report

## Findings (8 teachers' favorite technology tools used in their instructional process)

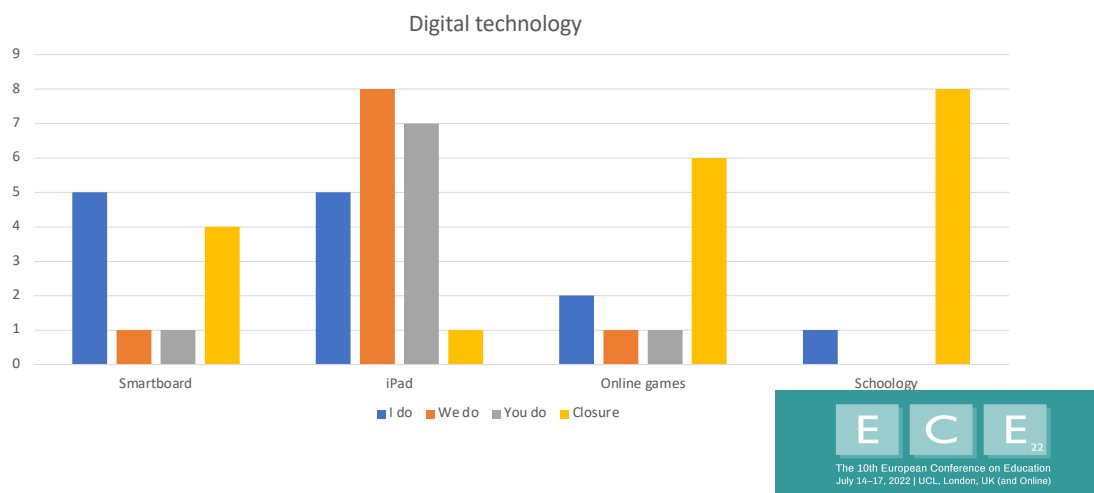


Figure 5 showed iPads are the most effective tools teachers and students use in “We do” and “You do” portion of instruction, which represented how digital technology can effectively support students’ learning through classroom discussion and teachers’ feedback to students by (collecting students’ pattern of errors or misunderstanding). Online games played a big role in the “You do” portion of instruction when used to review and summarize the lesson. Schoology helped teachers to collect students’ homework and reflect their next day’s lesson as well as share scored homework with students and parents.

The interview of this study explored detailed reasons of *what* digital technology tools the teachers chose, *why* they chose certain digital technology, and *how* they implemented those technologies to help their differentiated instruction for different math level students. Interview data represents how teachers and students implement digital technology in the 4-week math units.

## Summary of Interviews

### Interview Question One: *How Does Digital Technology Support Differentiation in Teaching?*

In the past, the eight in-service teachers have implemented several digital technologies tools in their class to teach different subjects. Through this study, most of them reconsidered those tools and systematically designed their 4-week math unit to rethink how digital technology can facilitate their differentiation in teaching so they can help students with different math abilities enlarge their learning outcomes. One teacher, for example, mentioned that the Smartboard was not used as traditional white boards anymore. She made the Smartboard be an interaction tool by doing game-based activities. She said, “Smartboard interaction really helps me deliver new knowledge with interaction.” She downloaded a math-related dice game (a place-value game to order different numbers) on the Smartboard. Students came up to front and hit the dice to get a new number (for example, 3,718 to compare the previous number, 3,687). Students used academic language (showed in the Smartboard as \_\_\_ is greater than \_\_\_ because \_\_\_) to say “3718 is greater than 3687 because the hundreds place “7” is great than “6” and the number “3” in thousands place is the same. Students demonstrated their new knowledge of number comparison by themselves. She felt “The math game can motivate students and it is much better than when I lecture them.”

Five teachers agreed and extended the game-based idea into the “I do” portion to do differentiated instruction. For example, when the teaching process moved to station learning activities, they can keep below average students in front of Smartboard and make sure they understand how to do number comparison by playing easier math games or lecture them. They knew some students preferred to get knowledge from close access to the teacher. This was especially true for students whose math ability was below average.

All eight teachers appreciated the Schoology technology which allowed them to collect all students’ homework, provide feedback to students’ homework, and prepare some review questions for next day class. In addition, Schoology also collected all teaching materials and students’ learning outcomes for students’ parents. One teacher made a comment “Those math games we played are showed in Schoology so students and parents can review and know what math lesson are doing in today’s math lesson.” Schoology helped teachers know different students’ performance in each math lesson so teachers can prepare their differentiated instruction next day for different students’ needs.

### ***Interview Question Two: How Does Digital Technology Support Feedback for Students?***

Group projects and station teaching were implemented in the “We do” portion. All eight in-service teachers in this section walked around to make sure each student was on the right track and approached target students to maximize their learning ability. One teacher commented that “During the project time, I use my own iPad to collect students’ errors [take pictures] and do error analysis.” All eight teachers did the same action during the “We do” portion. Five teachers may only give above-average students a hint, not answers. All of them took the opportunities to help below average and special needs students more direction with the iPad as a whiteboard. Teachers’ iPads played an effective role as they walked around, monitored different groups and provide different feedback to them.

One teacher stated, “My iPad supports me to monitor student errors. She took a picture of student errors. When another group had the same error, they may directly show the picture in her iPad to them. “It is so beneficial, because the previous group might have corrected their errors and the errors disappeared. All teachers commented the digital technology really supported them to give students feedback and collected students’ performance. When the class was in the “You do” or “Closure” portion, teachers can represent their observations and pictures to the whole class so everyone can learn from the pattern of errors. Also, teachers can share students’ projects and ask group members, “how did you get the answer?” to provide some feedback to students. Some teachers may like to use Schoology to provide feedback to individual students based on students’ different math ability. Here has showed that digital technology can support CBA-level 2 and level 3 to make sure all students were on the right track to do effective learning.

### ***Interview Question Three: To What Extend Does Digital Technology Support Students in Exploring New Knowledge--Especially in Their Group Projects?***

All eight teachers agreed that iPads played a key role to support students in exploring new knowledge. Five teachers used iPads in the “I do” portion. All of them used iPads in the “We do” portion and seven teachers used iPads in the “You do” portion. One teacher used iPads in closure. When I asked them how they use iPads, they all agree that iPads have met “providing an interactive environment” the most. One teacher said, “In the “We do” portion, iPads are used in students’ group project so effectively. They can do play-based teaching in math and facilitate students to do math projects. One teacher commented that, “Students in their group Googled the meaning of polygon and had rich conversations about the definition of the term.” iPads engage their learning activities strongly.

All eight teachers prepared different level of math games for different students’ needs. From this point of view, iPads also play a role of sending and displaying knowledge for different students. One teacher commented, “I see iPads can motivate students to learn math through group projects. I also see some students like to do projects individually. I appreciate that some apps in the iPad can provide individual projects for different students.” The teacher found iPad math games helped one student with autism in her class strongly, so she designed an individualized lesson plan with many math games and projects for the student. The teacher only needed to occasionally go to check the student’s self-learning process. The student demonstrated the best math performance during this 4-week math unit.



#### ***Interview Question Four: To What Extend Does Digital Technology Support Your Students to Present Their Projects?***

When teachers showed the term “polygon” on the Smartboard and asked students to explore the meaning, shapes and where polygons are found in real life, different groups may take turns to present what they found. The iPad can collect all students’ works and connect their iPad to the Smartboard so they can present their work to the whole classroom. After the presentation, students can directly turn in their works to Schoology. Eventually, students did not even use traditional paper/pencil in their learning task. One teacher said, “It is so effective to have technology doing this.” Technology potentially will take over the traditional teaching and learning model. Technology also provided more possible spaces for teachers to design play-based, project-based instructional models in the interactive environment.

From teachers’ perspectives, when teachers collected students’ patterns of errors by taking a picture or making notes in their iPad, they can show their collection in visualization to the Smartboard very well for whole class discussion opportunities. One teacher said, “I also collect students’ errors in their presentation to my iPad so I can show their errors in visualization and ask them questions.” It is obvious that digital technology can support both students’ presentations and teachers’ effective data collection.

#### ***Interview Question Five: To What Extend Does Digital Technology Help You Provide Feedback to Students and Make Meaningful Class Summaries for Students?***

Seven of eight teachers used digital games to do displaying, processing, and analyzing tasks in “You do” portion effectively. All eight teachers expressed that game questions were great tools to do the learning summary for students because questions can collect students’ answers (showed correct and wrong answers’ %). One comment from a teacher was “I put inquiry questions in the game so students and I can answer questions together as review or summary of the lesson.” One comment was “I love to use a game called Kahoot because it shows how students are learning.”

Schoology is one of most useful technology tools to provide feedback to students. All teachers put their homework in Schoology. Students brought their iPads home to do their homework and submitted their homework in Schoology. Teachers can provide feedback and grade students’ work in Schoology. This tool also allows teachers to collect different student’s math performance and prepare their lesson for the next day.

One teacher said if needed, she may use Schoology in the next day “I do” portion to show a pattern of error in the whole classroom. Overall, digital technology like online games (e.g., Kahoot, online math games) and Schoology can effectively play as sending, displaying, processing, and analyzing tools in teaching and students’ learning outcomes.

### **Conclusions**

The conclusion of this study is effective deployment of digital technologies is dependent upon meaningful teaching process (based on FaSMEd’s five FA strategies) and that differentiated instruction is the primary mechanism producing positive effects from digital technology. We believe that while a thorough working knowledge of tools is a necessary condition for differentiated instruction, it is not sufficient. The most important missing

element is helping educators develop meaningful teaching processes to know how much technology can help their students' content knowledge learning.

From teachers' observation and interviews with them, responses clearly showed students initiated more meaningful mathematical discussions and increased students' ownership of learning tasks when digital technology engaged in the whole teaching process. We may concern a causal relationship between "teachers use" and student's learning. This study all depended on the 8 teachers' report of their students' performance, and interviews after they complete the math unit. The effective size may be concerned. If we stand on students (4<sup>th</sup> graders) point of view with first time using a lot of digital technology and many project-based, game-based learning activities, the Hawthorne effect may need to be considered. Students may feel fresh, new, and fun by using digital technology in the 4-week math unit. Students may reduce their learning performance when technology turns to be a basic equipment in the next math unit.

### **Acknowledgement**

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## Appendices A

### *Five FaSMEd formative assessments (with CBA levels) and levels of digital technology*

FA and CBA levels	Levels of digital technology used in the five FA		
	sending and sharing	processing and analyzing	providing an interactive environment
1. Clarify and sharing learning intentions			
CBA 0-1 level			
2. Enhancing effective classroom discussions and participating in learning tasks			
CBA 1-2 level			
3. Providing feedback to students			
CBA 3-4 level			
4. Activating students as instructional resources			
CBA 3-4 level			
5. Activating students as the owners of their own learning			
CBA 3-4 level			

## Appendices B

The template of observation checklist

<b>Tech tools used in this lesson:</b>	<b>Sending/displaying</b>	<b>Processing/analyzing</b>	<b>Providing/interactive</b>
<b>“I do” stage CBA: Level 1</b>			
<b>“We do” stage CBA: Level and 2</b>			
<b>“You do” stage CBA: Level 2 and 3</b>			
<b>“Closure” stage CBA: Level 3</b>			

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***The 4th Industrial Revolution: A Redefinition of the Role of Higher Education?***

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**Abstract**

The 4th industrial revolution has begun to change -and will dramatically continue to change- the economy, the society, and the labour market at large. As Frey and Osborne (2013) have pointed out, automatization and digitalization will "destroy" or at least reconfigure, as many as 70% of jobs. While Arntz et al. (2017) do not agree with Frey and Osborne (2013) on the scope of the creative destruction that AI will bring about, they are of the opinion that many routine, repetitive tasks required for the jobs of the future will be taken over by AI, therefore changing the nature of the skills needed by the labour markets of the 21st century. The OECD (2019) points out that demand for higher education continues to rise in most countries (albeit not in the United States after the COVID pandemic). While the percentage of adults who have received tertiary education has risen on average from 35% in 2008 to 44% in 2018, the OECD states clearly that the expansion of higher education will only be sustainable if HEIs give graduates the skills they require for the future, on the one hand, and on the other, if higher education can match the supply of graduates with labour market and social needs (OECD, 2019). While, according to the OECD (2019) the employment rate for college graduates is 9% than for adults who only possess upper secondary education, and the former earn on average 57% more than latter, there is much more demand for some professions than for others. According to the same report, less than 15% of students who start college study engineering, manufacturing, and construction majors, and only 5% study computer science despite the enormous demand for these professionals. Furthermore, women are particularly underrepresented in the aforementioned programs: across the OECD, only 25% of students of these majors are women. This paper reports on the increased attention on the redefinition of the Role of Higher Education in the 21st century and its key implications for the labour market. The paper builds upon a constructivist approach, combining a literature review and research on key publications and academic reports.

Keywords: Labour Market, Digitalization, Employment

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## Introduction

The role of higher education has changed dramatically over the years. While the origins of higher education a millennium ago were to serve the needs of the church, with the advent of the Reformation and the Renaissance, universities became institutions that pursued knowledge for the sake of knowledge itself. However, the role of HEIs changes with the needs and the nature of the society where they are situated. One issue that has gained crucial importance in the age of automatization is whether education should be inquisitive (to satisfy curiosity and the pursuit of knowledge), or acquisitive (to provide graduates with credentials that are valued in the labour market).

Stokes (2015) discusses the relationship between tertiary education and employability. One of the questions this author addresses is whether American universities should have as their primary mission to prepare students for the workforce or to prepare them to be responsible citizens. Furthermore, Stokes (2015) argues that education providers and employers should share the responsibility of preparing students for the labour market, stressing that the business sector in the US is not sufficiently involved in the development of higher education curricula.

Stokes (2015) shares the view of both other scholars and organizations like the OECD that there is a mismatch between what colleges and universities are teaching and the needs of the labour market. One of the HEIs discussed by Stokes (2015) is Georgia Tech, whose graduates have a great demand in the labour market. Georgia Tech collaborates with employers and policymakers, offering its students experiential learning and cocurricular opportunities. In contrast, New York University, a recognized research institution, appears to avoid association with anything related to vocational education.

One of the most relevant topics addressed by Stokes (2015) is competency-based education, which focuses on aligning curricula and assessment with the job skills targeted in the curricula. Moreover, competency-based education enables students to earn college credits based on their experience or competences. Stokes (2015) points out that HEIs that partner with employers offer students better chances not only for employment, but also for career development.

The issue of employability becomes of paramount importance to prospective students, especially when they have to invest a large sum for obtaining an education and forego earnings during the time spent studying. Cooper (2021) studies the return on investment (ROI) for the median bachelor's degree in the United States. While the OECD report (2019) states that earnings for college graduates are on average 57% higher than earnings for adults with upper secondary education, Cooper (2021) points out that "Four in five engineering programs have ROI above \$500,000, but the same is true for just 1% of psychology programs". Cooper (2021) states that the most important financial decision of a prospective student is not whether to go to college or not, but rather the choice of program: While degrees in engineering and computer science, economics and nursing increase an individual's earnings by USD \$500,000, other programs, like for example art, music, philosophy or psychology, leave students in a worse economic situation than if they hadn't gone to college, and 28% of all study programs offered have a negative return on investment. However, the main reason students give for attending college is precisely to have access to well-paying jobs.



Tertiary education is not free in the United States. However, going to college also implies great costs to students in countries where tertiary education is free of charge, like it is in many European countries: Students who attend college give up other alternatives, like a full-time job, therefore foregoing income and professional experience gained from work.

Obtaining a college education is, for Cooper (2021) an extremely risky investment, especially in countries like the United States or the United Kingdom, where students must also pay a tuition: Between a fourth and a third of students who enroll in higher education drop out of school, not obtaining the benefits of a degree but keeping a huge debt.

Different stakeholders have different perspectives on employability: While, as stated above, the role of the traditional university, in the liberal humanist perspective, was the pursuit of knowledge and learning -which goes beyond the acquisition of practical skills- globalization, internationalization and the notable increase in the number of private actors in the higher education market, the role of higher education is being redefined (Cheng et al., 2021). For Cheng et al. (2021) there is a difference between employment and employability: While employment measures only actual job acquisition, employability measures the potential a graduate has to obtain and function in a job. In other words, employability goes beyond employment. Cheng et al. (2021) point out that, according to a study carried out in England in 2018, obtaining a higher education does not increase an individual's job opportunities in terms of obtaining a job; however, tertiary education increases the chances of an individual of performing a job. For Cheng et al. (2021) employability does not only depend on HEIs, but also on students, government and employers. While governments measure HEIs in terms of the employability of their graduates, the main responsibility for employability lies in HEIs.

Like for American students, the main reason for British students for pursuing higher education is having better opportunities in the labour market. However, for students from other European countries, employability is not limited to finding a job, but includes the ability to start an own business and to succeed in their occupations. This is of special importance in the age of the gig economy.

Cheng et al. (2021) state that employers value candidates who possess the ability to learn besides generic skills like problem-solving, critical thinking and teamwork. Furthermore, employers emphasize the importance of soft skills, which points to an area of disconnection between HEIs, government, and students, who appear to focus on hard- or vocational skills. Nowadays, degrees or qualifications are no longer the core criteria for employability. Employers in the United Kingdom are of the opinion that the responsibility for employability should be shared among students, HEIs, and employers, and that students should assume a greater responsibility for increasing their employability (Cheng et al., 2021).

The focus employability stresses the acquisitive nature of tertiary in the 21st century: As Cheng et al. (2021) put it, employability as the most important criterion of higher education reflects a culture of consumerism and commodification where investment returns become the main driver of HEIs and not expanding knowledge.

### **Is Higher Education in tune with the 4<sup>th</sup> industrial revolution?**

Levine and Van Pelt (2021) state that higher education was transformed in the 19th and 20th centuries to serve the needs of a national, emerging, analog, industrial economy. The economy of today is global, digital and knowledge based. Profound changes that will disrupt

higher education will take place, making the traditional models obsolete and forcing colleges and universities to close down.

For Levine and Van Pelt (2021), this transformation will occur mainly in 3 places: in the post-secondary educational sector that exists beyond colleges and universities; in new colleges and universities that offer competency-based online education, and in continuing education units of financially troubled institutions. The first sector includes organizations that reject time- and place-based education. These will offer low-cost degrees based on educational outcomes. Examples of this sector are corporate media companies, libraries, and museums.

The second sector includes universities that are accessible and affordable, like the University of the People; and examples of the third sector are units within universities that provide short- or part-time courses for graduates.

Levine and Van Pelt (2021) state that there will be a shift from seat-time to learning outcomes: education will no longer be measured in the number of semesters an individual studies, but rather on skill acquisition: There has been a substantial expansion of programs which instead of degrees award micro-credentials.

The transformation of higher education will be rooted in outcomes rather than in time and process. As Levine and Van Pelt (2021) put it: “The initiatives observed at the margins ... of higher education... point to a future that is outcome-based, time-independent, digital, individualized, low-cost, and available at any time and place.”

Levine and Van Pelt (2021) mention 5 new realities that HEIs must brace for, which are: 1) The entry of new content producers and distributors into the marketplace. These are cheaper and more flexible than traditional colleges; 2) A decrease of the institutional control of higher education as a result of the digital revolution, which will empower the learner with more choices; 3) Customers will expect from HEIs what they get from the music, movie and newspaper industries, which will translate into more accessible and more personalized education that best fits their needs; 4) A new model based on outcomes will replace the industrial era model of higher education based on process, or number of semesters attended; and 5) An increase of non-degree certifications and “just-in-time” education as a result of the need for upskilling and re-skilling. Examples of these are “micro-credentials” closely aligned with the dynamic needs of the labour market.

## Conclusion

The creative disruption brought about by automation and digitalization is already visible in the labour market, and as Frey and Osborne (2013) prove in their study, it will only increase. Many jobs that require repetitive, routine tasks will either disappear or be reconfigured, as new skills will be needed, and routine tasks become automated.

The percentage of adults who have obtained a higher education has increased from 35% in 2008 to 44% in 2018 (OECD, 2019). However, the OECD has pointed out that, in order for higher education to be sustainable, it must provide students with the skills needed by the labour market and the society. In other words, the nature of education in the 21st century is more acquisitive than inquisitive, having the satisfaction of social and economic needs as priority. Research of university-industry cooperation in different countries has proven that

some HEIs have strong cooperation schemes with industry, while others do not. Cooperation between HEIs and industry is pivotal if the existing mismatch of skills is to be overcome.

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***Mathematics in Southern Europe: Mathematics Education and Performance,  
Through the Prism of PISA, in Greece, Italy, Portugal and Spain***

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**Abstract**

A mathematically literate student, according to PISA and OECD, recognizes the role that mathematics plays in the world in order to make well-founded judgments and decisions needed by constructive, engaged and reflective citizens. Among European countries who have participated in PISA since 2000 till today, the top performing countries in mathematical literacy are concentrated more in East and North Europe and as a consequence, researchers are showing more interest in these European regions. The analysis and research pertinent to the Southern European countries' mathematical literacy competences of their 15-year-old students and their mathematics education systems is relatively scarce. The four Southern European countries that we will focus on this research are Greece, Italy, Portugal and Spain. More specific, Italy, Portugal and Spain scored at a similar level in mathematics over the period 2009-2018. On the other hand, Portugal and Italy have both showed a significant improvement in mathematics performance of their students throughout their participation to PISA. In contrast, Greece appears to have a stable mean performance and has a difference of more than 30 points ranking below the other three countries over the period 2012-2018. This paper aims to record Greek, Italian, Portuguese and Spanish students' mathematics achievements in PISA as they are formed over time. At the same time, it attempts to identify the similarities and differences of their educational systems with regard to their mathematics education and some reasons or factors that have led Southern European countries to these positions in PISA's ranking.

Keywords: Mathematical Literacy, Mathematics Education, PISA, Southern Europe

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# 1 INTRODUCTION

The modern societies and economies of 21<sup>st</sup> century “reward individuals not for what they know, but for what they can do with what they know” (OECD, 2019). OECD, has been promoting this fact through the Programme for International Assessment (PISA), which is held every three years, and assesses how well students can extrapolate from what they have learned and can apply that knowledge in unfamiliar settings, both in and outside their school context/environment. One of the three basic subjects that are being assessed by PISA is Mathematics. It seems very important for PISA to understand the degree to which 15-year-old students, who they are approaching the end of compulsory education, are adequately prepared to apply mathematics in order to understand important issues and to solve meaningful problems that arise from daily life (OECD, 2019). In order to encapsulate this broader concept of mathematics knowledge and skills, PISA constructs and assesses the concept of mathematical literacy which is defined as “an individual’s capacity to formulate, employ and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to recognize the role that mathematics play in the world and to make the well-founded judgements and decisions needed by constructive, engaged and reflective citizens” (OECD, 2019).

PISA, except for measuring students’ achievements in mathematical literacy, it is also regarded as one of the most prominent comparative and influential educational international assessment programs and has had a large impact on educational practices and reforms in many countries through the world. Its value also lies in providing international benchmarks, by comparing students’ performance between different countries directly or over time (Breakspear, 2012). One of the ET2020 benchmarks which is included in the strategic cooperation framework “Education and Training 2020” reports: the rate of underachievers<sup>1</sup> in reading, mathematics or science among 15 year-olds in the EU should be less than 15% by 2020.

The biggest attention for researchers is usually devoted to the countries where the highest PISA scores are recorded, in order to identify and incorporate the factors producing the “good” results. Among European countries the countries with the highest scores in PISA 2018 in mathematics, were Estonia, Finland, Poland, Denmark which are the countries who have met the 15% ET2020 benchmark and are followed by Ireland, the Netherlands and Slovenia. Between the above countries, Finland used to be for years the most commonly listed influential European country, like for Greece and Spain (Breakspear, 2012), while in more recent years, Estonia is in the spotlight (Tire, 2021). Most of these countries are located in Northern and Eastern Europe. “Always the gaze seems to be to the North” (Prokou, 2018). Southern European countries, despite their common features, have so far not been in the spotlight for researchers, analysis and comparative educational studies (Novoa, 2018), even if Portugal the last PISA years appears to have taken a quantum leap (Crato, 2020) and is referred as “Europe’s biggest success story at PISA” (Maroco, 2021).

The Southern European countries which are included in the present paper are Greece, Italy Spain and Portugal. Except for the same climate, the same landscapes, the same way of life

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<sup>1</sup> As underachievers in PISA are defined those students who fail to reach the minimum proficiency level necessary to participate successfully in society (European Commission, 2019).

that they are all four sharing (Guimaraes et al., 2018) they are also having common characteristics such as their similar socio-political and contemporary economic situations. Moreover they have had cultural affinities and long-lasting historical and cultural interactions between each other. According to some recently research regarding their education, a common feature seems to be the lack of decentralization in educational decision making (Argyropoulou, 2015). Moreover in these countries the provision of education is mainly done by the state with private education accounting a small percentage, teachers are referred to, as civil servants after being appointed and paid also by the state (Argyropoulou, 2015). Their different positions in world dynamics influences the comparative education section (Palomba & Capa, 2018). The Southern-European countries are seen as eternally attempting to bridge the various types of gaps that divide them from the Western-European countries which are considered more ‘advanced’ (Palomba & Cappa, 2018).

The present study addresses the following questions: How students’ performance on PISA’s mathematical literacy of the four southern European countries has been shaped over time? What are their basic characteristics and reforms of mathematics education the last 20 years, which may have emerged on the occasion of PISA’s results or may have affected the PISA’s mathematics results? What are their basic similarities or differences of the four educational systems with regard to their mathematics education or reforms?

## 2 METHODOLOGY

This study is primarily based on the data of the mathematical literacy achievements and performance of the 15-year-old students recorded in the four selected Southern European and OECD countries participating in PISA. More specific this data comes from the online available PISA database for the years between 2000 and 2018. Moreover, more data for the present paper comes from available online policy documents for all four countries and research reports. The method of this study is the collection and review of the available literature.

## 3 RESULTS

### 3.1 PISA and Mathematics performance

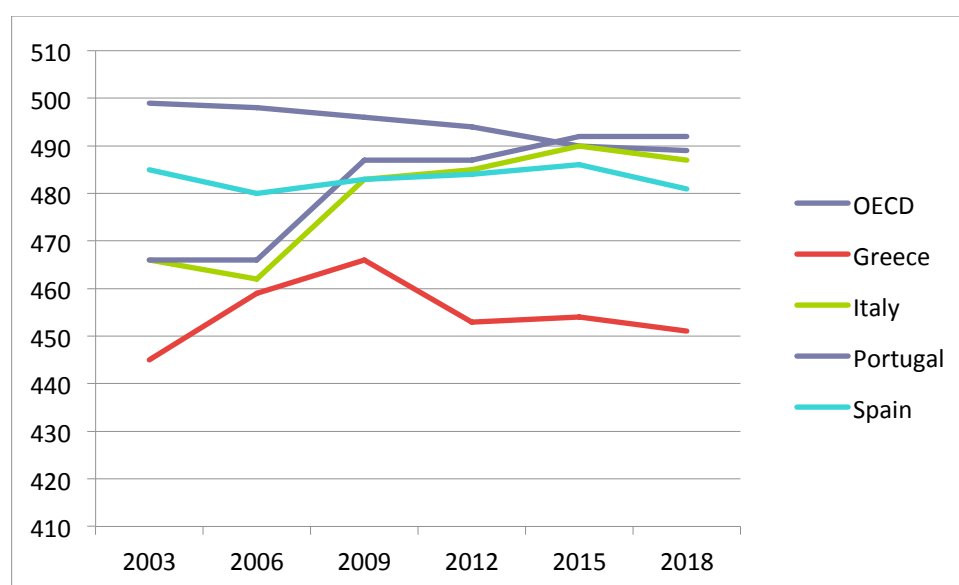


Figure 1. Average mathematics performance in PISA over time

Greece's mean performance in Mathematics has been consistently below the OECD average ever since it participated in PISA with an average difference from it, around 40 score points. It is described by OECD as hump-shaped, mainly due to a spike in performance in PISA 2009 while the performance in all other years was stable (OECD, 2019b). Stable has remained also Spain's<sup>2</sup> mean mathematics performance, around a flat trend line and below the OECD average, with an average difference around 11 score points, throughout the country's participation in PISA, and above Greek's mean scores with an average gap of 30 score points. In Italy, mean performance in mathematical literacy has improved since 2003 and 2006, by an average of 20 score points, and then remained stable after 2009, with scores in 2015 and 2018 around the OECD average. According to the OECD country's note of PISA 2012, Italy was one of the countries with the largest improvement in mathematics performance since 2003. Similarly to Italy, Portuguese students' mean performance in Mathematics has improved since 2003 and 2006 while their mean performance in 2018<sup>3</sup> was close to the level observed over the period 2009-2015 and is placed above the OECD average. According to PISA's 2018 reports, Portugal is the only member of OECD that has experienced a significant improvement in its students' performance in all PISA's subjects, throughout its participation in PISA (OECD, 2019b). Both in Italy and Portugal the average 3-year trend in mathematics mean performance is statistically significant. Greek students' mean performance in mathematics appears with a difference of more than 30 points ranking below the other three countries over the period 2012-2018. Specifically, this difference between Greece and Portugal in 2018 reaches the 41 mean score points in Mathematics, which corresponds to one whole school year. Italy, Portugal and Spain scored at a similar level in mathematics over the period 2009-2018.

Furthermore, large regional differences in mathematics performance can be observed within Italy and Spain. In Italy the North-center regions perform generally better than the southern ones (Furno, 2021) and in PISA 2018, Trento and Bolzano scored close to the top performing European countries. The biggest regional gap reaches the 54 score points, a difference which is equivalent to more than one year of schooling. In Spain the picture is more diverse than in Italy, between 17 regions. The gap among Spanish regions is 92 score points in PISA 2018, the equivalent of more than two years of schooling.

The students who scored below PISA's level 2 are characterized as low performers<sup>4</sup>. The global indicators for the United Nations Sustainable Development Goals identify Level 2 as the "minimum level of proficiency" that all children should acquire by the end of secondary education (OECD, 2019b). According to PISA 2018 the share of Greek low achievers in Mathematics remains among the highest in the European Union with shrinkage of 3.1 percentage points, since 2003. Italy and Portugal reduced both their share of low achievers by

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<sup>2</sup> In PISA 2018 OECD has decided to defer the publication of Spain's reading results due to the implausible student-response behaviour. The mathematics results, however, appear less affected by this anomalous response behaviour and they were published (OECD, 2018b).

<sup>3</sup> In PISA 2018 it was required that at least 80% of the students chosen within participating schools participated themselves and this percentage was not met by Portugal, where only 76% of students who were sampled actually participated. But, through a non-response analysis based on data from a national mathematics assessment in the country it was shown that the upward bias of Portugal's overall results was likely small enough to preserve comparability over time and with other countries. As a result, the data from Portugal were therefore reported along with data from the countries/economies that met this 80% student-participation threshold (OECD, 2019b).

<sup>4</sup> Low performers are characterized the students who cannot compute approximate price of an object in a different currency or compare the total distance across two alternative routes.



8.1 and 6.8 percentage points respectively, between 2003 and 2015, with almost similar percentage as the OECD average. Spain on the other hand increased this share by 1.7 percentage points, but its percentage of low achievers has been close to OECD average and close to Italy's and Portugal's in PISA 2012 and 2018.

On the other hand, the students who performed at or above PISA's proficiency Level 5 are characterized as top performers<sup>5</sup>. The share of Greek top performers and the Spanish ones has had no significant changes through the PISA years. According to Gomendio's research (2021), the low levels of Spanish students' mathematics performance and the stagnation over time seem to be explained mainly by the low proportion of Spanish top performers. However, in contrast to Portugal high achieving students have significantly improved their scores and exceeded the corresponding OECD share. In Italy the corresponding share also improved in 2018 since 2003, but without reaching the OECD average.

In PISA 2003 boys in Greece outperformed girls in mathematics by the notable amount of 19 points, but in PISA 2018 there was no difference between genders. This, however, is due to the reduction of boys' performance and not to the improvement of girls (OECD, 2019c). At the same time the boys from Portugal in PISA 2003 outperformed girls by an also notable amount of 12 score points, but in 2018 this gender gap was narrowed by 3 score points (OECD, 2004; 2014; 2019d). One of the largest gaps in favour of boys among PISA participating countries and economies through all PISA years is noted in Italy and has remained stable in all years, by an average of more than 16 points. In Spain the gap between boys and girls increased, in favour of boys, from the amount of 9 points in 2003 to the more notable amount of 16 points in 2012 and then in 2018 this gap was reduced to 6 score points close enough to the OECD average gap. Greece is the only country among the four, whose difference between boys' and girls' performance is lower than OECD's average difference in PISA 2012 and 2018. Portugal also in PISA 2012 reduced the gender gap in a lower amount than the OECD average but still, it came short the difference manifested in Greece.

In Greece, Portugal and Italy, the share of girls who did not reach the baseline level of proficiency was reduced between 2003 and 2018. In Italy and Portugal a reduction of low performing boys also took place between 2003 and 2018. Greece and Spain reduced the share of low performer boys between 2003 and 2012 but in 2018 this share increased, without big difference from the OECD average but higher than it. A notable increase in the share of both boys and girls, who performed at Level 5 and 6 between 2003 and 2018, was shown in Italy and Portugal, with Portugal surpassed the OECD average for boys in 2018. Spanish and Greek boys and girls top performers narrowed their share, but nevertheless, failed to reach such a notable amount, between 2003 and 2008.

### **3.2 Education policies and reforms in mathematics education the last two decades**

#### **3.2.1 Greece**

In Greece, according to Breakspear's (2012) survey, "PISA has provided policy-makers with useful information and tools to improve the quality and efficiency of the existing education system in Greece". Nevertheless, the Mathematics performance of Greek students in all the cycles of PISA remains stable and below the respective OECD average (Nolka & Sofianopoulou, 2021). This stable and low position could be justified to some extent by the poor alignment of Greek mathematics curriculum and mathematics textbooks in lower

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<sup>5</sup> Top performers are characterized the students who are capable of advanced mathematical thinking.

secondary school with PISA's mathematics framework and their strong content focus (Nolka & Sofianopoulou, 2021; OECD, 2018a; IEP, 2019). The latest revision and update of the mathematics curriculum for primary and lower secondary education dates back to 2003. According to a survey of the Greek Institution of Educational Policy (IEP, 2019), it was showed that in curriculum, mathematics applications appear as consequences and not as fields within which Mathematics emerge, as stated in PISA. The problem solving in curriculum appears as an application of a specific theory and not as a real-life problem which has an invisible or a subtle connection with the "theory", as encountered in PISA's mathematical literacy problems (IEP, 2019). Concerning the Mathematics textbooks which are a central tool for implementation of the mathematics curriculum, in lower secondary school, contain low percentage of real-life math problems (IEP, 2019). Moreover, in Greece, no national assessments in mathematics are performed in order to track student performance comparatively across schools, at a regional or national level, either in primary or lower secondary education. The only high-stake national assessment is the Panhellenic university admissions examination which is administered at the end of upper secondary education. In lower and upper secondary school, written progression and school leaving examinations are administered in Mathematics, which are performed by each school and their respective Mathematics' teachers (EC/EACEA/Eurydice, 2021a). In 2013 some efforts were made to create a more national approach to student assessment in selected school subjects, including mathematics, in grades 10 and 11, with national tests banks including question items at different levels of difficulty. In school year 2015/16 the use of these test banks was abandoned, given concerns about equity and early school leaving (OECD, 2018). So due to the absence of national standardized assessments in Mathematics to provide regular information about students learning outcomes (OECD, 2020), PISA results in Mathematics and data could be provide some evidence to this direction or an international overview of student's performance in relation to other OECD and European countries in order to develop a higher-quality and more equitable mathematics education (OECD, 2018).

### 3.2.2 *Italy*

Confronted with lower-than-expected results in student performance in PISA 2003 and 2006, the Italian Ministry of Education (MIUR) launched the program "Plan for information and awareness about the OECD-PISA study and other international researches" in 2008 (Arzarello et al., 2015). The program first involved Mathematics and Science teachers from 9th and 10th Grades and since 2009 the project has been enlarged for primary and lower secondary teachers, with main goals: i) the information of teachers about the OECD-PISA study in a clear and correct way, ii) the analysis of the PISA framework for Mathematics, particularly the structure of the test and the public items, iii) the comparison of them with the most diffuse didactical practices in Italian classrooms, iv) the analysis of Italian students' results in PISA study, v) the comparison of PISA mathematics framework with the one used by the Italian National Assessment System (SNV), which began to be applied in 2008. The National Institute for the Evaluation of the Education System (INVALSI) develops standardized national tests to assess students' mathematical competence, reading comprehension and grammatical knowledge and administers them to students of 2nd, 5th, 6th, 8th and 10th grade. Moreover, since 2008 in Italy, all students in grade 8 have had to face a final standardized SNV test on mathematical and reading competencies which is part of the national final examination and is carried out at the end of middle school (Arzarello et al, 2015; Garuti et al., 2017; Garuti & Martignine, 2015). The SNV tests differ from PISA in its frequency (annual vs. triennial), on the type of tested population (census vs. sample), on the target population (grade based vs. age-based students) and for its goals. The SNV tests

results aim to provide a national benchmark for the assessment of students at different grades taking into account the national curriculum (Garuti et al, 2017; Garuti & Martignine, 2015). Although the SNV framework is very strongly coherent with PISA framework, the items which are used in the Italian national assessments are asking for more arguments and proofs, which seem to reflect with a typical Italian tradition in mathematics teaching (Arzarello et al, 2015). Additional in 2008, the Italian Ministry of Education organized a teachers' education program, "the m@t.abel project" which means basic mathematics with e-learning, with the participation of teachers from grades 6th to 10th. The main aim of the project was to provide examples of best practices in mathematics classrooms, which are often drawn in coherence with PISA mathematics framework (Arzarello et al, 2015).

### **3.2.3 Portugal**

The disappointing results of PISA 2000 for Portugal set the stage for the much-needed education reforms that took place in the following years (Maroco, 2021). Setting off in 2001, policymakers started to set the stage for the endorsement of a series of ongoing education measures by placing great importance on mathematical education (Maroco, 2021; Nolka & Sofianopoulou, 2021). In 2008 a new curriculum was introduced and in 2012/13 a revision of it for mathematics of the second cycle of primary and lower secondary education took place with the aim of setting learning standards of basic skills to be reached by all students and to give more flexibility over curriculum management (OECD, 2014). In 2017/18 a more flexible curriculum sprang from a pilot programme and has been in effect since 2018 (EC/EACEA/Eurydice, 2021b).

Concerning student's assessment, in 2003 the low-stakes were promoted and the corresponding high-stakes exams for Mathematics at the end of grade 9 were used in 2005 (Maroco, 2021). The application was also expanded (2012) to grades 4 and 6 (OECD, 2020b) but was terminated in 2016 (Santiago et al., 2012). Today, student's assessment includes both internal and external national assessment. The internal student summative assessment is organized by the schools while the external one is carried out by the Educational Evaluation Institute (IAVE) and involves national final exams at the end of basic education cycle, grade 9, in the subjects of Mathematics and Portuguese, whereas in grades 2, 5 and 8 standardized tests are administered. There are also national examinations in the end of general secondary education (EC/EACEA/Eurydice, 2021b; Liebowitz et al., 2018; OECD, 2020b). According to Marôco's and Lourenço's research, exists a concurrent and content validity of PISA with the national high-stake exams for mathematics (Crato, 2020; Maroco, 2021).

The implementation of the "Action Plan for Mathematics", in 2005, aimed at the improvement of students' motivation and the encouragement of positive attitudes towards mathematics learning and education. It is referred that "allows students to dedicate more time to the study of mathematics and focus on exploration, investigation and problem-solving" (EACEA/Eurydice, 2011). The six components of the plan were: i) implementing a mathematics plan in each school, ii) training teachers in basic and secondary schools, iii) reinforcing mathematics in initial teacher training, iv) readjusting the mathematics curriculum throughout the compulsory education system, v) creating a resource bank or database specifically devoted to mathematics and vi) evaluating textbooks on mathematics (OECD, 2013).

Another measure was the focus on mathematics teachers training (EACEA/Eurydice, 2011). Through the "Action Plan of Mathematics", the training of teachers in both primary and

secondary education, collaboration between them and co-teaching in the classroom were developed. Also, in measures like “Teams for Success”, schools received support teachers, specialists in mathematics teaching, to help them implement innovative three-year projects focused on the improvement of students’ mathematics learning, the promotion of professional development programmes, the creation of database of educational mathematics resources, the reorganization of initial teacher training programmes and access to STEAM teaching (Kearney, 2011). In additional, at the end of the school year, every school carried out self-evaluation within the scope of the Mathematics Plan II which included an evaluation of the strategies implemented, student performance in mathematics, and the development and implementation of the mathematics programme (EACEA/Eurydice, 2011).

### 3.2.4 *Spain*

The disappointing results of Spanish students in PISA 2003 provoked debate and generated significant attention in the media for weeks and the main issue raised, was to understand the reasons for the decline (Gortazar, 2018). Spain’s education system is blind, since no national evaluations exist and no information is available on how students perform according to homogeneous standards. As a consequence, PISA’s results represent the only information available concerning how Spain performs in relation to other countries and over time, but it also informs on the divergence between Spanish regions (Gomendio, 2016). Unfortunately, despite the furore over PISA, this did not lead to education reforms for more than a decade. The Spanish education system from 1990 till 2013 has followed the comprehensive model LOGSE, which was based on the premise that all students should be treated equally. The most extreme forms of LOGSE regard evaluations as a discriminatory tool that unfairly segregates students who fail (Gomendio, 2021). In 2013 an education reform (LOMCE) was approved with its implementation in primary school in academic year 2014/15. Three of the main pillars are: i) the modernization of curricula and the definition of evaluation standards to promote the acquisition of both knowledge and competences instead of the prevalent model which is required almost exclusively the memorization of the contents, ii) the re-definition of areas of the curricula that would be defined by the state and the regions and iii) the establishment of national evaluations that would in turn, allow the detection of students lagging behind early on, so as to provide the support required to catch up, and would signal the knowledge and competences required to obtain the degrees at the end of each educational stage, so that students, teachers and families would be aware of the standards required. However, the national evaluations were never fully implemented due to the intensity of the political pressures against them. In 2014/2015 the new curricular contents as well as the national evaluations in primary, were implemented, while in the following academic year, the full implementation of the calendar designed for evaluations at the end of lower secondary and upper secondary was interrupted (Gomendio, 2021).

## 4 CONCLUSIONS

Among the four countries that we analyzed in the present paper, Portugal and Italy have both showed a significant improvement in their 15-year old students’ mathematics performance throughout their participation in PISA. Spain and Greece have shown a more stable curve in their students’ mathematics performance. However, Spain scored similarly to Portugal and Italy during 2009-2018 and has scored far above them in the preceding years. Greece appears to have a difference of more than 30 points ranking below all the others over the period 2012-2018 while Portugal is the only that has exceeded the OECD average in 2015 and 2018.

In Spain and Greece due to the absence of national standardized tests in mathematics, PISA's assessment represent the only available information concerning the performance of their students in relation to other countries and also internally in each country over time. Despite the furore over PISA in Spain and the information of the disappointing results of Greece, didn't lead to mathematics education reforms, in Spain for more a decade and in Greece for almost two decades. On the other hand, in Italy and Portugal, the starting point for the ongoing education measures was the very first years of the disappointing PISA results. The implementation of national tests in Mathematics in compulsory education and the focus on mathematics teachers' training are two common educational reforms that have taken place in both countries. Moreover, in Portugal some other educational reforms were the frequent reevaluation or revision of mathematics curriculum in compulsory education and the improvement of the level of students' motivation in mathematics classrooms. In addition, Italy has managed to organize a program focusing specifically on PISA namely, the "Plan for information and awareness about the OECD-PISA study and other international researches".

With the optimistic examples of Portugal and Italy to stand out for their remarkable improvement among the countries of Southern Europe and even the whole of Europe, maybe it's time to turn the gaze into South. As long as PISA 2022 has Mathematics again as a major domain to be assessed, provides the opportunity to expand the comparisons in Mathematics students' performance in Southern Europe.

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***Using a 3CAPs Conceptual Framework to Explore Hong Kong Kindergarten Teachers' Perceptions About Visual Arts Education***

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**Abstract**

In the past decades, the visual arts in early childhood education were dominated by conventional approaches to shaping children's artistic output. Craft making formed the major content of visual arts activities in kindergartens, and teachers relied on product-oriented instructions to deliver visual arts teaching to young children. However, there was a revision of the Hong Kong kindergarten education curriculum in 2017, when the government recognized the importance of children's creativity in the arts by placing more emphasis on the elements of free expression and creativity. The early childhood curriculum reforms were found to be a de facto revolution of teaching ideas, leading to a remarkable gap between teachers' reported beliefs and their practices. Using a 3CAPs (i.e., culturally appropriate, contextually appropriate, and child-appropriate practice) conceptual framework, in-service kindergarten teachers' views on and their competence in visual arts education in Hong Kong are examined. A belief–practice gap in implementing visual arts education in Hong Kong kindergartens is evident from the voice of teachers. Kindergarten teachers generally show support towards creativity in early childhood arts but face considerable difficulties to put it into practice. Policymakers and reform leaders should act boldly to develop curricula and pedagogies that are culturally appropriate, contextually appropriate, and child-appropriate.

**Keywords:** Early Childhood Education, Visual Arts, Belief–Practice Gap

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## Introduction

Art is a kind of aesthetic experience and is commonly defined as a form of representation through which private ideas and concepts are shared publicly (Eisner, 1988). As children's first language (Wright, 2003b), the visual arts provide a way for young children to learn and express themselves. Early visual arts education has been a subject of debate among many international researchers and practitioners of early childhood and arts education (Twigg & Garvis, 2010). Some scholars have argued that every art form should be introduced to children in a balanced fashion, as children may have favorable learning experiences from each form (Bautista et al., 2018).

In Hong Kong, reforms were introduced into the kindergarten, primary school, and secondary school curriculums in the early years of the new millennium. The government stressed the importance of motivating students for lifelong learning, explaining its expectations regarding the curriculum reforms in its document *Learning through Life: Reform Proposals for the Education System in Hong Kong* (Education Commission, 2000). The *Guide to the Pre-Primary Curriculum* (Curriculum Development Council, 2006, p. 18) was revised in 2006. The pre-primary curriculum framework aims to “nurture well-rounded children for life with ethics, intellect, physique, social skills, and aesthetics, and to motivate children’s learning attitudes positively for lifelong learning” (Curriculum Development Council, 2006, p. 18). The Government of the Hong Kong Special Administrative Region (HKSAR) formed a committee tasked with developing a “free quality kindergarten education scheme,” whose remit included curriculum revision. In March 2017, the committee reviewed the *Guide to the Pre-Primary Curriculum*, renaming it the *Kindergarten Education Curriculum Guide* (“the Guide”). In this new guide, the learning domain *arts* was renamed *arts and creativity* to highlight children’s freedom of expression and creativity. In this revision, the core framework for developing well-rounded children remains unchanged, with aesthetics continuing to be a component of the curriculum goals. Children’s capacity for art appreciation, creative expression, and imagination are highlighted in the document, and elements of the visual arts are also mentioned (e.g., lines, colors, shapes, and forms of expression). In general, the new guide has strengthened teachers’ basic understanding of early visual arts teaching (Curriculum Development Council, 2017).

## The 3CAPs Conceptual Framework

Previous literature provides evidence of a belief–practice gap among Chinese kindergarten teachers (Li et al., 2011). Since the turn of the millennium, early childhood curriculum reforms have been implemented in Hong Kong to promote Western educational ideologies and practices, such as a play-based curriculum and child-centered instruction (Li et al., 2011; Liu & Feng, 2005). These reforms have forced Hong Kong teachers to replace their traditional teacher-directed pedagogies with imported child-centered ones, even though they are used to the traditional ones in which they were trained (Li & Chen, 2017). This pedagogical tension has caused a cultural collision between Chinese traditional culture and these aspects of imported culture (Li & Chen, 2017). According to Li (2007), every culture is unique, with its own specific value system that cannot be understood universally (Li, 2007a). Li (2007b) introduced a 3CAPs (culturally appropriate, contextually appropriate, and child-appropriate practice) conceptual framework to characterize curriculum development in early childhood education (ECE). This framework is divided into three parts. First, through *culturally appropriate practice*, curriculum development should be sensitive to Chinese social ecology and culture and not overly dependent on Western ideas. Second, through *contextually*

*appropriate practice*, curriculum developers should respect local contexts and not implement a single quality standard in the face of considerable regional differences. Third, the *child-appropriate practice* should be adopted, as individual Chinese children in different areas may differ with respect to local culture, schooling experiences, and family upbringing (Li & Chen, 2017, p. 1479). Given this belief–practice gap, policymakers, and reform leaders should act boldly to develop curricula and pedagogies that are culturally, contextually, and individually appropriate for children. The early childhood reforms were found to be a de facto revolution of teaching ideas (Liu & Feng, 2005); however, they brought about a remarkable gap between teachers’ beliefs and practices (Li et al., 2011).

### **Culturally Appropriate: How Do Teachers Perceive the Early Visual Arts Curriculum in Hong Kong?**

As Hsieh (2004) noted, ECE pedagogies have been influenced by Chinese social expectations. The philosophy of Confucianism reflects the context and essential values of traditional Chinese culture. In particular, as the school system is socially hierarchical, persons of lower status should be obedient and respectful to those of higher status. Confucianism highlights group interests, unlike child-centered Western approaches that stress individualism. In traditional Chinese ECE, a well-behaved child is expected to conform and participate in group activities (Hsieh, 2004). Chinese cultural beliefs about the importance of effort, discipline, and obedience are also evident in the kindergarten curriculum (Lau & Rao, 2018). Therefore, the environment for early childhood arts education in Asia is very different from that of Western countries. Arts-related pedagogical practices in Asian kindergartens are traditional and product-oriented in nature (Bautista et al., 2018). Teachers tend to teach children visual arts collectively instead of individually. Most of the time, the teacher-child ratio is 2 to 22. In such a relatively large class, their only choice is to deliver highly structured and product-oriented teaching. Therefore, children must follow instructions from teachers’ direct teaching, despite teachers’ support for creative pedagogies in visual arts. Unique children’s voices are hard to find among the children’s artworks produced in Hong Kong kindergartens.

### **Contextually Appropriate: What Are the Barriers to Implementing Early Visual Arts Education in Kindergartens?**

In Asian regions, with their highly competitive, pragmatic, and efficiency-driven expectations, parents typically demand that teachers train their children in following rules by delivering explicit instructions (Ellis, 2014; Lee & Yelland, 2017). Since Hong Kong’s educational environment is examination-driven, parents are likely to have high expectations of their children’s academic performance and school readiness (Fung & Lam, 2009). Some teachers might be pressurized by parents who value academic subject areas more than visual arts for children’s learning. Parents might think that visual arts should not be a subject area for children’s learning or for developing children’s academic or even career paths. Therefore, early visual arts education (e.g., drawing, painting, sculpting, and collage) has already become marginalized at the periphery of the regular curriculum (Chan & Chan, 2007). However, the Hong Kong scenario for early childhood arts is not unique. In Singapore, Bautista et al. (2018) found that time constraints can be a contributing factor, as many kindergarten curricula in Singapore are restricted to 3–4 hours per day, so teachers can allocate very limited time to delivering different forms of arts activities. Moreover, many teachers have scheduled prescribed learning and routine activities for their classes, causing the ‘hurried teacher, hurried children’ phenomenon. Accordingly, very little time has been left for early visual arts

education. Some teachers are tempted to teach children directly at every step to complete the visual arts activity in a limited time.

### **Child-Appropriate: How Do Teachers Perceive Their Competency in Teaching Visual Arts?**

Hong Kong kindergarten teachers do not have sufficient arts training to acquire the necessary arts-related pedagogical skills (Leung, 2018). Teacher training programs provide too little time for teachers to learn early childhood arts as an academic discipline, making it difficult for teachers to deliver specific arts knowledge or skills to children (Eisner, 1988). Leung (2018) found that the visual arts module offered in the Bachelor of Education program accounted for only three credits out of more than 100 credit hours of study. This limited skills-based arts training is insufficient for enabling kindergarten teachers to teach visual arts. Therefore, when teaching children the craft-making process, teachers may repeat the steps they have acquired through rote learning (Leung, 2018). Teachers know that they lack sufficient content knowledge in visual arts, as most of them have not received sufficient academic training in this area. For example, the knowledge about the physicality of materials and visual arts pedagogies is not included in the early childhood teacher education programmes in Hong Kong. Many teachers learn this knowledge just from their peers after joining the industry. Through observation and imitation, teachers acquire their competence via repeated classroom practice. To handle unexpected responses from children, kindergarten teachers incline to provide highly structured teaching patterns for more predictable classroom control.

### **Conclusion**

In Hong Kong's complex culture, if imported ideas and pedagogies are not culturally appropriate, contextually appropriate, and child-appropriate, they will be deformed, transformed, and eventually reformed. First, early visual arts education (EVAE) should be culturally appropriate practice. Many scholars, including Silverman (1995), Mayer (2004), and Hmelo-Silver et al. (2007), have tried to integrate instructivist and constructivist methods into classrooms. These two types of practices are not necessarily conflicting or dichotomous. They could be adjusted and incorporated into a culturally appropriate practice for Hong Kong kindergartens. Second, EVAE should be contextually appropriate practice. Constraints are very common in an institutional system with its own resources and policies (Porcaro, 2011). Therefore, we must understand how contextual factors lead to the adoption of teaching practice (Palincsar, 1998), including how teaching practice is applied institutionally (Arnseth & Ludvigsen, 2006). Third, EVAE should be child-appropriate practice. Teachers lack expertise in visual arts teaching; therefore, they do not have the skills or strategies to deliver child-appropriate practices, contributing to the theory-practice gap (Fowler, 1989; Kindler, 1997; Piscitelli, 1993; Wright, 1991). In the future, teacher education programs should highlight these skills and strategies to empower and equip EVAE teachers.

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***Cosmopolitan Legal Education:  
From Innerius and the Westphalian Paradigm to the Modern Law School***

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**Abstract**

The law school has not always been one that would be predominantly engaged with national legal matter. The subject of law, as a field of learning, has for a number of centuries been the toy of national educational systems, because law has been the toy of nation States. Law, the discipline, which nowadays draws materials not only from jurisprudence but also from economics, history and political science, has with the rise of the Westphalian paradigm been mostly what the German legal scholars would call a *Landesjurisprudenz* in epistemic terms, a subject mostly destined to serve the needs of a given locality. The article runs counter to what came to effectively become law's traditional approach to education. It posits that the discipline of law as well as legal education in itself would certainly benefit from more cosmopolitan and extrovert models of pedagogy.

Keywords: Cosmopolitan Legal Education, Innerius, Westphalian Legal Paradigm, Nation State, Law School, Legal Pedagogy, Legal Education

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## 1. Introduction

The aesthetic value of the subject of law can nowadays be found in the fact that law becomes an increasingly cosmopolitan and interdisciplinary subject. Our subject continues to be doctrinal, and rightly so, at least for most intents and purposes, but it clearly isn't as insular as it used to be. Law, as a pedagogic field, moves towards more internationalised and cosmopolitan forms of legal education. It strives to create and maintain a new epistemic unity to it, and it seems to be in the process of moving away from old paradigms of highly provincial models of legal education. Law, the toy of the nation State, has had to follow suit in legal educational terms, legal education being a by and large national exercise (*Landesjurisprudenz*). To this day this approach still somewhat prevails. Nonetheless, it should be maintained that there are positive developments in the sector, making the subject of law somewhat more open-ended, international and less parochial in its outlook. As far as the paper's substantives would be concerned, the paper acts as a critical analytical exposition in the wider area of legal education, taking into account historical and certain contemporary information in the area of its investigation.

## 2. Irnerius and *Ius Commune*

Law as a taught subject has not been as insular as it has conventionally been between 1648 and the first decades after the latest world war. Prior to this, up until early modernity, most of Europe would in one way or another traditionally aspire to the teaching of Roman law and Canon law, with or without practical law digressions to local custom. However, law up until relatively recent decades was and continues to be a largely national pedagogic exercise. Law, in the era of modernity, has indeed grown to become the very machinery behind the evolution of modern nation States. A leading German legal scholar, observing the deterioration of the subject into nation-oriented narratives, cautioned his colleagues of such a trend already in the 19<sup>th</sup> century (Von Jhering, 1924, p. 15). Thus, one would also observe in most of the 19<sup>th</sup> and 20<sup>th</sup> century the rather peculiar phenomenon of law being borrowed from other jurisdictions only for the subject to be taught in a rather national fashion, or with a national agenda in mind. This is the story of Europe and the Western world in legal substantive and legal pedagogic terms: most of our laws would have been modelled on modern German, French, English or American laws, only for local educational systems to offer law as a subject to be modelled on the idea of the nation State. However, such a trait has not been unique to the Western world. For instance, Asian and African legal systems have developed their own national legal narratives even though comparative materials have been borrowed or imposed from elsewhere. Of course, if a system borrows materials from other systems, there is no such thing as an implied moral obligation for such a system to teach the subject in the same way it would be taught in the source system but why borrow then? Why not develop unique legal solutions and unique educational and pedagogic models in the first place? Furthermore, the terms "German", "French", "English" and "American" law may be objectionable in themselves, in that French and German law borrowed significantly notions, ideas and doctrines from Roman law in the first place, English law has been informed by Anglo-Saxon and Norman laws and customs, while American law draws on the common law tradition in substantive and procedural terms and so on. To seek "national" origins within these modern sources of law (English law, American law, German law and French law) might, therefore, be an epistemic chimera in itself. What makes American law American? What makes German law German? In any case, continental Europe would, of course, traditionally subscribe to the *ius commune* (common law) tradition, the legal tradition which would combine the forces of Roman Law and Canon Law. This was the law that would be taught and respected in the

formal centres of legal education in Europe. Irnerius would be one of the persons to teach the (re)discovered Corpus Iuris Civilis in the European Occident and would establish the School of Glossators, practically an analytical-explanatory school of thought in legal pedagogy. Nonetheless, whereas Irnerius has been an important figure in the school, it would be important to state that others, such as Bulgarus, one of the Four Doctors, may have played a comparable role to that of Irnerius in the School of Glossators. So too, Pepo, Irnerius' teacher, seems to have been associated with the teaching of Roman law (Clark, 1987, p. 672; McSweeney & Spike, 2015, p. 22 citing Winroth, 2000, p. 158), Matilda of Canossa and her mother Beatrice being the patrons of both Pepo and Irnerius. Of course, the systematisation and the epistemification of law pre-existed Irnerius and the Four Doctors, and continued with the School of Post-Glossators, the Humanist School, the School of Natural Law, the Historical School and the Pandectists (Zepos, 1974, p. 899 citing Vinogradoff, 1929). Irnerius, however, would be one's conventional pre-modern scholar that would lay certain of the critical foundations for the further systematisation and epistemification of law.

Irnerius would be gracefully nicknamed by a jurist, Odofredus, "lucerna juris", the law's lantern, as he made significant contributions to what seemed to be at the time a more cosmopolitan legal subject, such contributions echoing on European legal history and culture. Remarkably, the medieval law schools in Bologna that would be otherwise created by such leading academic legal personalities as Irnerius would achieve permanence and would eventually transform themselves into a university (Russell, 1959, p. 168). The law school of Bologna has also been the mother of modern universities (Sherman, 1908, p. 504). Irnerius would otherwise aim to create universal didactic legal texts in Latin. His works would effectively not only be destined for his students but also for anyone who could speak the Latin of his time. Moreover, his two main contributions as a legal teacher would be the addition of [certain] glosses to the Justinian codification and the adaptation of Justinian's Novellae into the Authenticum (Pennington, 2019, p. 112).

Irnerius was a *de facto* cosmopolitan jurist. There are many reasons that this may well have been the case: first was the fact that he received his education in Italy and taught there, even though he may not have been Italian by descent. Second, his law school in Bologna would draw students from all over Europe (Mather, 2002, pp. 330-331). Third, the same law(s) would effectively be taught by him to a developing but varied class of formally educated lawyers and so on.

## 2.1. The Cosmopolitan Essence of *Ius Commune*

*Ius commune*, on the other hand, represented in itself a sort of universal understanding of the law in continental Europe, as it was based on certain of the fundamentals of Roman law and Canon law, even if it was the case that the local laws of European jurisdictions could take precedence over it up until European laws started to become codified. Historical project Rome, despite its imperialist upbringing, was indeed about a legal equilibrium between the universal and the specific. Rome was the centre of centres, the common spiritual fatherland of all, conquerors and conquered. As Modestinus, probably a Syrian Greek law scholar in the 3<sup>rd</sup> century AD (even though others would question his precise origins (Millar, 1999, p. 102)), put it elegantly "*Roma communis nostra patria est*" (Ando, 1999, p. 30 citing Modestinus ad Dig. 50.1.33). At this point, one notes that the very cosmopolitan essence of *ius commune* would be found in the fact that it would perceive its diverse recipients as subjects of the same essence of law (cosmopolitan universality amongst diverse peoples). Additionally, prior to the era of European legal codifications, especially in the Middle Ages,

legal education in Europe would start to become more concrete, more systematic and, certainly, more scientific. Law was effectively finding itself in the process of gradually transforming itself from an art and a science into something that would more closely resemble a science, even though one could certainly argue that even today law has not wholly and unequivocally transformed itself into a perfect science, a perfect *episteme*. In many respects, law, despite its solid scientific foundations, is still a sort of a scientific art to be mastered than a subject to be taught and learnt *stricto sensu* e.g. the way chemistry, physics or mathematics would be taught and learnt. In any case, Irnerius would be at the forefront of developments that would result in the strengthening of the scientific character of law in the Middle Ages, him effectively introducing the philological and scientific approach to the study of law. As stated, Irnerius must have been a *de facto* cosmopolitan legal personality in his outlook as an educator, in that his law school would attract scholars not just from the Italian peninsula but also from other parts of Europe. To this day, however, one would not be perfectly certain of the origins of Irnerius and there would be significant controversy with regard to who Irnerius actually was. Beyond this, there is speculation that he may have been of German descent (Pennington, 2019, p. 108). In any case, with regard to his approach, his approach was clearly more epistemic than an approach that would mostly resemble a *techné*. An elegant definition as to what constitutes an art over a science is the one that implicitly came from Sherman some time ago, i.e. an art is *mutatis mutandis* a secret science (Sherman, 1908, p. 500). It is the very transparent, rational and methodological essence of a science that makes a cognitive field a science. In this respect, the point to be made here is that in much of the history of ancient Rome Roman law was more of an art, i.e. at least up until 254 BC, when Tiberius Coruncanius first professed law to the public (Chroust, 1955, p. 513; Sherman, 1908, p. 500). In the Eastern Roman Empire too, at least in its first steps, law must have still been both an (emerging) science and an art, with the additional note that the subject was subsequently heavily Hellenised over the centuries (Zepos, 1974, p. 899; Chitwood, 2017, p. 150). Of course, the first attempt to make what clearly was legal art into a rational artistic form (*mutatis mutandis* a science), under the influence of Greek philosophy and the scientific methods of the Stoics, was made by Scaevola the Younger and Cato the Younger (Sherman, 1908, p. 500). Moreover, the very Corpus Iuris Civilis in the 6<sup>th</sup> century AD only strengthened law's path towards scientific enquiry and learning. However, the School of Irnerius seems to have decisively tilted law even closer to the field of *episteme*. Indeed, whilst law had already become more of a science with the major developments, which one observed in the 5<sup>th</sup> and the 6<sup>th</sup> centuries AD in the Eastern Roman Empire (see, for instance, the establishment of the Law School of Constantinople and the Justinian codification), Irnerius, through his systematic approach, moved law even closer to the field of scientific enquiry. Prior to Irnerius, however, law was also clearly and systematically taught in Rome, in the 6<sup>th</sup> century AD, and in Ravenna in the 11<sup>th</sup> century AD (Sherman, 1908, p. 504). However, Irnerius' insistence on the systematic and analytical study of law was nothing but a call for a universal science of law, a universal legal *episteme*, something that legal scholars in the centuries post 1648 would almost certainly observe with a certain sense of nostalgia. Thus, as Zweigert and Kötz remind us, law is [still] clearly at odds in epistemic terms [and, by extension, in pedagogic and educational terms] with the degree of unity which one observes in other epistemic fields:

[t]here is no such thing as “German” physics or “British” microbiology or “Canadian” geology (Zweigert and Kötz, 1998, p. 75)

The nationalisms of Europe have effectively shattered the dream of a united subject of law for the Europeans. Cultural(ist) and national(ist) legal narratives have triumphed, all in the

name of the peculiar and rather mystical notion of the spirit of the people(s). At least up until 1945, these narratives have almost demolished every single hope for a united epistemic legal field, a universal legal science. Law was and, to a great extent, continues to be the toy of the nation State, despite positive developments in European and international law.

Law, however, “whatever the philosophical essence in which it is conceived, is [admittedly] an expression and an element of the whole civilization in a certain space and certain time” (Zepos, 1974, p. 898). Nonetheless, the Eastern Roman Empire’s vision for ‘one law’ was resurrected, if not salvaged, in the Occident by Irnerius and his disciples, who would perceive their subject as one of universalising epistemic essence. The generally superior character of Roman law over the majority of the various European local customs must have been instrumental in this respect. Thus,

Roman law acquired a quasi-divine status; medieval jurists saw it as the universal law of Western Christendom, something close to a Platonic form of law that the laws of individual kingdoms should, ideally, emulate (McSweeney & Spike, 2015, p. 25).

The spread of Roman law throughout Europe, through the initial Eastern Roman Empire’s legislative efforts, the subsequent efforts of the law schools in Bologna and the efforts of *ius commune* scholars in many parts of Europe, would now be close to unstoppable. The march of Roman law almost all over Europe, after 11<sup>th</sup> century AD, resembled only the march of the Roman legions in the building of the Roman Republic and the Roman Empire in the Mediterranean and the then known world. Resistance to it was existent but would eventually become futile. And yet, despite the ever-increasing force of Roman law in the Continent, European legal customs would often be respected, if not prioritised. For instance, Roman law, prior to the enactment of the German Civil Code 1900, would apply in parts of Germany *in subsidio* (Zimmermann, 2006). Nonetheless, Roman law has had the characteristics of a superior type of law, a more sophisticated and coherent type of law, to the point that it would brook few comparisons with the laws of local populations. As a matter of fact, the main historical role of *ius commune* was to fill the great gaps of legal systems in Europe in addition to acting as the medium of interpretation of existing local laws (Mather, 2002, p. 336). New law schools, which would have been modelled on the Bologna law school, were created in Modena, Pisa, Montpellier, Naples, Toulouse, Orléans and Salamanca. All such schools would teach Roman law and Canon Law but deemphasise or disregard local laws (Mather, 2002, p. 332).

The Germanic tribes would, of course, have destroyed the Western Roman Empire in 476 AD but, as stated, law would still be taught in Rome and Ravenna in the 6<sup>th</sup> and the 11<sup>th</sup> century AD respectively. Traces of Roman law would also be found in *leges barbarorum* and in *leges romanae*, the latter being fundamental forms of teaching in the so-called rhetorical schools (Zepos, 1974, p. 900). Nonetheless, the full resurrection of the study of the law in the Occident seems to have effectively occurred through the establishment of the law school in Bologna, which in turn resulted in the creation of the first university with degree awarding powers, the University of Bologna. Roman law in the European West would thus fully re-assert its epistemic unity in the otherwise intellectually dark Middle Ages, despite the fact that one would have noted a certain degree of vulgarisation of such law in the particular geographical space previously. Furthermore, this renewed interest of Western legal scholars in the Eastern Roman Empire’s law would have had significant implications for the development of the world’s legal systems through the medium of late Roman law (McSweeney & Spike, 2015, p. 21). Post-glossators spread the systematic study of law

throughout Italy and imitators would be found in the rest of the European West. From the 15<sup>th</sup> century onwards Chairs of Roman Law would be established almost throughout Europe, in Italy, Spain, France, Germany, Holland, Poland, England and elsewhere (Zepos, 1974, p. 900). Roman law in Europe re-asserted its cosmopolitan essence, in that it would create the substratum for certain common understandings of the law but also much of the basis for new codification projects such as the German Civil Code 1900, which combined, for instance, the intellectual forces of both Roman law and Germanic custom. This state of affairs, i.e. the spiritual spread (“reception”) of Roman law almost all over Europe, reached a certain relative peak approximately half a century before a new political and legal paradigm would be generated in Europe, the Westphalian paradigm. With the exception of England, Roman law would come out victorious as the leading common European legal source in most European countries, even though its extent and form differed from country to country (Zepos, 1974, pp. 901-902). Concurrently, Roman law, where received, would occasionally have to live together with local legal custom and so forth.

### 3. The Anomaly of the Westphalian Paradigm in Legal Pedagogy and Education

Furthermore, it would have to be maintained that law was never meant to be a national pedagogic exercise. Aside from the absence of the concept of “nation” (as in nation State) in the Middle Ages, the nationalisation of the subject of law was not quite exactly on Europe’s agenda prior to 1648. Law would become ever more nationalised only with the advent of the nation State. Indeed, when Roman law was created the nation State was not even a remote consideration. Beyond this, nation States were, are and will be, for so many reasons, highly artificial entities that arose out of historical accidents or historical designs in the era of modernity. Law, on the other hand, would traditionally aspire to the universal. Cicero was quite adamant in his perception of the law as a universal subject, especially in law’s *ius gentium* manifestation. To him, law, as in *ius gentium*, was clearly not to be confined to Rome alone. So too, Rome would actually recognise the local customs of the conquered (*mos regionis*). One will not examine here the motivations, ulterior or not, of republican and imperial Rome in its approach to show tolerance to the laws of localities. Yet, the point remains: Rome, despite its imperial ambitions, was cosmopolitan enough to at least recognise and accept to a certain extent the local laws and customs in the provinces which it would otherwise rule. However, with the Treaties of Westphalia in 1648, Europe would clearly start moving towards nation-oriented understandings of the law. This would ultimately have considerable implications not just for the national statute books but also for legal education. For instance, the codification movements in Europe would further strengthen nation-oriented traits in the study of law. It has also been observed that law itself would follow the nationalising trends of educational systems, something that has been apparent since early modern education (Rönnström, 2012, p. 202).

#### 3.1. The Westphalian Paradigm *Per se*

Whilst the Treaties of Westphalia have been celebrated as the Peace of Westphalia in the bibliography, these are the treaties that are ultimately responsible for the rise of the nation State (Westphalian system) and, by extension, for the rise of nationalisms in Europe and the rest of the world. International law still effectively revolves around the Westphalian system (Nathan, 2002). The Peace of Westphalia ended, of course, the Habsburgs ambition for a universal unitary system under the same monarch in much of Europe with the creation and the strengthening of modern nation States. What looked like a necessity at the time resulted in even greater divergences amongst Europeans and, eventually, two world wars. It is not as

if the Treaties of Westphalia have been responsible for the two world wars. Rather, these have been treaties that first allowed the nation States to grow and strengthen to such an extent that the two world wars that followed a few centuries afterwards were but a natural consequence of the rise of the nation State in the face of human history. The idea of cosmopolitan legal education opposes the approach that places the nation State at the exclusive centre of one's analysis, in that nation States are by and large historical artifices and accidents. Here one notes also that, whilst the Westphalian paradigm has served Europe and the world through the medium of international law, its fundamental basis deteriorated into nationalist patterns. Thus, the main concern one would have in relation to the Westphalian paradigm is that it effectively created the conditions for the future nationalisms that devastated Europe and much of the world. One of the victims of the Westphalian paradigm has also been the subject of law, resulting in more provincial understandings to it. What seemed like a paradigm that would eventually favour democracy and the self-determination of a people, albeit through the rather artificial packaging of the nation State, came to be in the long run a precondition of ever more insular legal and political systems. As stated, the Westphalian paradigm still somehow persists in most States around the world. Even if we take modern Europe, as the continent with the slightly more internationalised and cosmopolitan views of what legal education and the nation should be in contemporaneity, much of the rest of the world seems to still subscribe to the Westphalian paradigm. Furthermore, certain legal education developments in recent decades have been rather positive. However, one swallow does not make a spring and the Erasmus initiative alone, an otherwise positive mechanism with regard to the educational mobility of lawyers (and not only) in Europe, is simply not enough in itself to create more cosmopolitan legal jurists. Again, this initiative, which goes back to 1987, stands for a positive development but even the lawyers that graduate from the modern European law school seem to be still largely nation-law oriented. One also observes certain positive developments in a certain few North American law schools but, clearly, similar educational developments need to occur not just in North America and Europe but also around the world. In an ever more cosmopolitan Europe and an ever more cosmopolitan world, it would be quite crucial to inspire our future lawyers to the lost epistemic unity of the subject of law.

Finally, with regard to the overall prevalence of the Westphalian paradigm in recent centuries, the great codification movements in the 18<sup>th</sup>, the 19<sup>th</sup> century and, to a certain extent, in the 20<sup>th</sup> century, were interesting, in that they were "national", on the one hand, whilst heavily drawing on Roman law, on the other hand. From the political point of view, these were clearly national(ist) legal projects, symbolising the unity of the state, close to the Westphalian paradigm. "[T]hese codifications were political, liberal and nationalistic achievements, which in a certain sense express the liberal and nationalistic spirit typical of the 19th and 20th centuries" (Zepos, 1974, p. 903). From the legal point of view, however, such leading civil codes as the French and the German one were also heavily influenced by Roman law, even though local customary law would certainly be recognised within them. Thus, it would seem that the Westphalian paradigm is still with us, even though the penetration of Roman law into almost all of Europe's legal systems would make these systems somewhat more open to a common legal *via media*. The powerful effect of politics into law would allow us to maintain that the Westphalian paradigm still prevails, despite the fact that most of the European lawyers would be mutually intelligible in legal epistemic terms.

#### 4. Why There is Need for a Cosmopolitan Paradigm in the Modern Law School

The modern law school ought to re-discover the cosmopolitan essence of the subject of law. There are many reasons as to why this should be the case. First, a more cosmopolitan legal subject would allow our students to more thoroughly appreciate diversity but also universality. Second, the sense of freedom that our subject would instil in our future law students and graduates, through more open-ended cosmopolitan legal discourses, would bring the subject much closer to the ideal of liberal education (as opposed to our subject being only doctrinal or fundamentally doctrinal). Third, world-class legal citizens would be created (as opposed to *homines speciales* that mainly specialise in the law of a given locality), as cosmopolitanism and, by extension, cosmopolitan legal education have to do with the creation of world-class citizenry (Platsas, 2015, p. 156). Fourth, the subject would come closer to international law's innate cosmopolitanism (Gordon, 2013, p. 906). Fifth, our future lawyers would be able to more readily attain intercultural fluency skills. Sixth, a more cosmopolitan agenda in the modern law school would also bring the school up to speed not only with contemporary developments, as these arose from the phenomenon of globalisation, but also with the future creation of world-class citizenry, which may already be in the making.

#### 5. Conclusion

This exposition briefly explored what came to be an *ius commune* approach in legal pedagogy and education post the developments in the medieval school(s) of law in Bologna and elsewhere. In this respect, it also enquired into the developments in the area of legal education from the Middle Ages to the Westphalian paradigm. It has expounded upon the need for a more cosmopolitan type of education and pedagogy in the modern law school. When it came to this article's proposition in favour of more robust cosmopolitan models of legal education and pedagogy, it was manifested that it would not only be the recipients of such that would benefit from them, but also the discipline of law itself, as it would enhance its position in the field of epistemology. Societies themselves would also benefit. In Europe but also in certain schools of North America, one observes the slow but steady rise of more internationalised forms of legal education. It is only hoped that such forms of education will inform the legal educational systems of more countries in the future.



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***A Scheme for Enhancing a University President's Performance in a Transforming World***

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**Abstract**

As society evolves and technology advances, a university like any other dynamic institution will need to change and adjust its teaching, research and community service to stay relevant, keep pace and prepare future professionals and leaders. These adjustments need to be reflected in the university's outlook and strategic plan to remain relevant and competitive. Consequently, the role of a university president is constantly evolving as they are tasked with strategically developing and positioning their university to benefit from future developments and provide best possible service to the community. Experience shows that whilst university presidents have the most important, challenging and dynamic position at their respective universities, they typically have training and expertise which can be best described as 'narrow and deep' this contrasts with the skills needed for the presidential role in a changing world which requires 'broad experience' across many disciplines of academia, management and finance. This paper will analyse and reflect on the role of the university president or leader of a higher education institution in a changing world. It will argue that university presidents often lack the essential training and expertise needed for the presidential role which can be best described as 'broad experience' across many disciplines of academia, management and finance. Then, it will offer some thoughts to maximise chances for success in a relentlessly changing world.

Keywords: President, University, Success, Changing World

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## Introduction

The title of the position varies at different institutions, president at many, but also known as rector, provost, principal or vice-chancellor. These titles originated from the English and Scottish influence on higher education.

The President is the principal academic and administrative officer of the University and is accountable to the Governing Board for the exercise of these responsibilities. More specifically, a president is expected to (McCaffrey, 2004; Baban, 2017, 2018, 2022).

- Provide energetic and inspiring leadership in the directing a university to meet the evolving needs of the community and the nation
- Lead the recruitment of high-quality academic staff to begin the process of establishing a national and regional reputation for high quality academic degree programmes, scholarship and research
- Lead the recruitment of high quality senior administrative staff to establish an efficient and effective administration and management structure integrated with the academic mission
- Establish core values of integrity, high standards, dedication and innovation amongst all levels of staff and students
- Lead and enthuse all levels of staff to work individually and corporately to build an efficient and effective organization of which they are properly proud.
- Promote relationships and where appropriate working links with other regional and international universities.

The university president is a key governance, management and administrative post for the university and it is also critical for the wellbeing of the community and establishing an informed society, a society that is evolving sustainably on the basis of equity and citizenship, at ease with itself and can embrace new technologies.

In fact, higher education has never been more important in the history to encounter and dissipate the spread of extreme and intolerant views throughout society. The modern world requires an understanding of other peoples and cultures, hence, the need for graduates who are capable of being independent thinkers and problem solvers. Henceforth, the on-going changes and transitions in communities need to be reflected in university planning and thinking to meet its objectives (Baban, 2022). The need has never been greater for active and effective citizens with a clear understanding of local, national and international events and mastery of technical skills (Peterson, 2008; Balderston, 1995).

Universities are expected to respond to pressures for greater accountability while preserving academic governance models and traditions. Consequently, universities are evolving into models which are much closer to the corporate model with greater scrutiny and accountability by students, parents and governments built in. Evidently, if this trend continues, universities will increasingly look outside academia for their leaders - people with well-honed managerial and communications skills who will act as the public face of the university, someone who goes around shaking hands and kissing babies and raising funds for the institution. These circumstances have made the president's job more complicated and political; they have to be charismatic, aggressive and not step on toes often while making tough decisions. Hence, presidents need to be good managers as well as accomplished academics, able to juggle an

increasing array of complex issues and answer to a growing number of constituencies (Peterson, 2008; Baban, 2017, 2022).

This development is not welcomed by everyone, as some tend not to subscribe to the idea of universities endangering their independence. A business leader may come in and run the university more effectively and the outcomes may be improved. However, as a consequence, the soul of a university will be harmed.

In terms of university functions and tasks, the president, as the chief executive officer of the institution is responsible for the overall strategic planning and the sustained performance of the University. More specially, these can be divided into the following overlapping areas (McCaffrey, 2004; Balderston, 1995; Baban, 2017, 2022);

i. Planning: This involves preparation for and attempts to shape the future. More specifically, leading the vision, the strategic planning, and implementation of the growth and development of university programs and facilities to meet future challenges and needs. Time is also spent on working with plans for appropriate construction or renovation of facilities, or with opportunities to expand or adapt programs and services offered to students and the community.

ii. Leadership: Leading and directing the daily operations of the University, the tasks can include chairing university meetings, making strategic and operational decisions related to finance and budgetary resource issues, personnel, facilities planning, academic programs and cooperative public-private partnerships.

iii. External Relations: The involves hosting and/or travelling to meet with national, regional, state, community, and business leaders as well as alumni, members of the general public and members of the media. As the most visible symbol of the University, the President is also expected to extend the University's services and goodwill to the public, and to find ways for the University to contribute to the social, economic, and intellectual development of the state as well as the local community and the region.

In terms of accountability, the President reports to the Board of Trustees, the Governing Board or the Senate, based on the governance structure, for the exercise of these responsibilities. This governing body is formed from a group of individuals elected or selected by different constituencies including the Chancellor, Academic staff, captains of industry and at times, the Education and Higher Education committee in the Parliament. In addition, there are faculty and student representatives who serve as ex-officio, non-voting Board members. The Board's primary role is to establish the broad policy initiatives that guide the development of the University. The Board delegates the administrative responsibility for managing and leading the University on a daily basis to the President.

### **The Presidency and the President; and Overview**

Society in general and the Academic Community in particular tend to have an idealistic image of the nineteenth century college and university presidents. In this ideal, the president, an experienced person of vision, is joined by scholars and students who share that vision, and moves boldly forward with invariably supportive senate and trustees. The backdrop is idyllic, and everyone is shielded from the daily turmoil of the world. This romantic organization, probably has never existed entirely, except in the imagination of the public (Baban, 2018).

However, Universities like any other dynamic institutions are subject to change. Modern universities and the role of President are generally influenced by three types of changes. These are external changes driven by government affecting the provision of opportunities, changes driven by advancement in technologies and consumer demand for educational services both nationally and internationally. These include for example, the delivery of education through distance learning programs using web-based and web-enhanced courses and video-conferencing. The final changes are internal changes and adjustments within the organisation of the universities generated as a response to the external changes (Baban, 2022).

The role of the president in modern universities can vary based on the type of institution and its decision-making configuration in terms of being private/independent or public, size of the student body, the programs offered (associates, bachelors or graduate and professional studies) and historical background. Despite this variation, the president represents the most powerful and influential individual in the academic community. To the external community, the president embodies the university and its values, and leads the institution in its contributions to academia, industry, government and the community. Internally, the president is expected to direct and manage the university with regard to realizing its strategic objectives (Rile, 2001).

University presidents tend to manage and govern their universities employing various types of power. These include; reward power, using rewards to recognize those individuals that support the mission and goals of the institution. For example, Faculty receiving tenure as a reward for strong teaching ability and academic expertise. Charismatic power, the paternal/maternal president who is serving in the parental role and providing guidance and counsel to the students, possesses charismatic power. However, Legitimate power is the most important to the president. This power is accepted by the university community without regard to resources, charisma, rewards or punishments. Legitimate power tends to stay in place until abused or ineffectively used by the President (Rile, 2001; Baban 2022).

Evidently, the president has over the years needed to adapt to arising cultural and societal changes including (McCaffrey, 2004; Balderston, 1995; Baban, 2022);

i. Deference to authority, authority has traditionally rested on the assumption that people assigned authority deserve to have it, but in recent years acceptance of, and deference to, authority were eroded by wars and conflicts. Accompanying the erosion of authority has been a loss of social capital, the bonds that hold together communities and nations.

Deference to authority and having exclusive access to information and records has also rested on the assumption that the authority figure possesses specialized knowledge. With the relatively recent development of the Internet, we can all gain access to complicated information, and decisions that may have relied on specialized information, possessed by the select few, are becoming fewer and fewer.

ii. The democratisation of information is also having dramatic consequences in the society, for example, patients routinely challenge their doctors based on information (and misinformation) globally, derived instantly from the internet. The interest in pursuing information from alternative sources is especially acute among young people who have never known any other way of conducting their lives.

iii. The generations effect, University presidents in the early twenty-first century come from a generation that knew a different way of life than their students and, often, their faculty and staff. They deal daily with the consequence of the erosion of a respect for authority, the democratization of knowledge which has made everyone an expert, the loss of social capital, while at the same time the competition for funding and students has increased.

Evidently leading a university is a challenge and an uncertain undertaking. The role of a president is hard and often requires out of hours work. Furthermore, they are vulnerable to unbearable political, economic and social pressures, especially early in their presidencies. Presidents also need to adapt to ongoing cultural and societal changes (McCaffrey, 2004; Balderston, 1995).

### **An Analysis to the Academic Path to Presidency**

Evidently, University presidents have the most important and difficult position at their institution, yet they typically have received the least amount of training for their position. Usually, a President has earned a doctorate or holds an equivalent terminal professional degree. Very often a President has substantial experience in higher education administration along with proven leadership, management, planning, fund-raising, public speaking, and organizational skills (Baban, 2018). There is no one automatic “path” to becoming a president, it often depends on the particular needs of a given university at a given time (Baban, 2022). Hence, a President should have in-depth knowledge of strengths, weaknesses, threats and opportunities facing higher education in general now and in the future.

The conventional path to University Presidency often is as follows (Baban, 2018, 2022):

1. The candidates obtaining a PhD based on extensive and original research in their specialised very narrow chosen field.
2. The candidates becoming a lecturer, senior lecturer and Professor. This path will provide the candidates with the academic understating and evaluation for the processes involved in quality teaching, learning, research and research training.
3. The candidates gaining administrative and management experiences in Higher Education through competitively obtaining and performing the duties of Head of Department, Associate Dean and Dean. This path will provide the candidates with the necessary administrative, management and financial experiences as well as an in-depth and practical knowledge of Human resources management.

Examining the three points above will show that the candidates would have learned about the university, about management and delegation mostly in relation to the candidate’s discipline and department. As result, some will argue that the candidate’s training and experiences are insufficient for the presidency and can be described as being narrow and deep. More specifically:

1. In terms of qualifications: postgraduate studies and research degrees often required isolation, increased specialization, disciplined thinking, and a methodology that is based on 'deconstruction', i.e. braking concepts into very small pieces.

2. In terms of administration and management; the positions of Head of Department, Associate Dean and Dean, typically require the candidates to interact mostly with colleagues in the same discipline, hence, people that mostly think in the same way and will prioritize the same matters within and outside the university. Having a common outlook and experiences within the professional and personal circles for a significant time, can lead to assumptions that colleagues view the world as the candidates do and that those who think otherwise are at best inappropriate or unfamiliar or, at worst, badly motivated.

Hence, within this context, the candidates may have had few opportunities to deeply and regularly interact with people unlike themselves. A university president daily interacts with many people with very different life experiences including, legislators, board members, alumni, the media and community members who do not necessarily see the world in the same way as the President. This does not mean they are badly motivated, or want to harm the university. It does mean that their life experience and, therefore, their perspective, are different.

A significant challenge for a University President is then the transformation from the '*narrow and deep environment*' based on '*deconstruction, i.e., breaking concepts into small pieces*' into an environment requiring '*breadth*' and '*construction, i.e., piecing small fragments to establish a University Wide picture*' (Baban, 2022). Hence, the position requires a holistic view, synthesis and comprehending how the various segments and specializations in higher education are essential parts of and form the University as a whole.

### **Maximizing Chances for Success**

The question often asked is Why do some university presidents succeed, while others do not? Evidently there is no one path to guarantee success, partly because presidents invariably do not have total control over their success or failure.

Trow, 1985 identified four aspects of university leadership. First, symbolic leadership which is the ability to effectively communicate and embody, the universities central goals and values both internally and externally. Internally, being able to articulate the institution and its decisions to staff, by linking its organization and processes to the larger purposes of teaching and learning in ways that strengthen their motivation and morale. Externally, articulating the mission effectively helps to shape its image, affecting its capacity to gain support from its environment and to recruit able staff and students. Second, political leadership which is related to the president's ability to resolve the conflicting demands and pressures of the many constituencies, internal and external, and in gaining their support for the institution's goals and purposes, as may be characterized by them. Third, managerial leadership, this is related to good judgment and the capacity to direct and co-ordinate the various support activities of the university including the selection of staff; the ability to develop and manage a budget and plan for the future. Finally, academic leadership represented by the ability to recognize excellence in teaching, learning, and research; in knowing where and how to intervene to strengthen academic structures; in the choice of able academic administrators, and in support for them in their efforts to recruit and advance talented teachers and scholars.

Some have indicated that university presidents tend to (McCaffery, 2004; Balderston, 2008, Baban, 2017, 2018, 2022):



1. Understand the unique characteristics of their universities including the organization's culture, its history and way of doing things which shapes the behaviour of people in the university. This understanding enables them to articulate an appropriate vision, goals, and expectations of excellence. They understand what the organization needs at a particular time in its history, and they are able to focus on the organization, not on themselves. Some organizations require transformation. Hence, the need for bold leadership at this point in their history. They must drastically alter the way in which they do business in order to survive, and transformational leadership is essential. Others need to continue on the same path. Understanding the organization's needs at a particular time in its history and leading accordingly, makes all of the difference.

2. Understand the difficult nature of the job and its complexity. All presidents face difficulties which are considered normal and part of the job.

3. Understand people. Often, people who are important to the university behave as factions or interest groups. Faculty, governing boards, legislators, community members, and students may have unrealistic expectations or may resist change. As president you are pulled in several directions at once. Consequently, university presidents often feel that others don't understand these pressures and don't provide the necessary support.

4. Identify goals that are sufficiently common, elevated, and ambitious, that the interests or factions can be united, at least most of them, most of the time. Understanding how to identify and describe those goals in a way that has meaning to diverse groups is a major challenge for a successful president.

5. Understand themselves. Successful presidents approach their jobs as students of the presidency, exactly as they saw themselves as perpetual students in their academic field. They engage in more thinking than acting, and adopt the problem-solving approach, hence look for more information or other points of view, or seek alternative approaches.

University presidents can bring their qualities of leadership, management and administration experiences to the success equation but to succeed they will need to have the legal authority and resources to act, to choose among alternatives, even to create alternatives, in short, to exercise discretion. Without that discretion and the authority and resources behind it, a president cannot exercise leadership, whatever his/her personal qualities are (Trow, 1985).

The leadership awareness and strategic challenges segments of the program clearly indicated overlapping issues facing leaders of universities across the world. The following steps would contribute to addressing these issues:

- Newly appointed presidents require support in the form of coaching or mentoring to provide guidance through the initial challenges.
- Boards of trustees, directors, or governors need to better prepare for their governance and strategic roles to be able to provide better guidance and direction.
- Leadership teams require training in leadership and management skills to more effectively support the head of their institutions.
- Major strategic issues are not getting sufficient priority due to lack of preparedness and recognition of priorities on the part of newly appointed presidents.

- Greater attention needs to be given to developing effective succession plans in university institutions, accompanied by appropriate professional development, to prepare potential presidents for their future roles.
- There is a general recognition of the importance of bringing about change in university cultures. This includes enhancing teacher quality and utilizing information technology, but there remains a lack of clarity on how to bring about this change.
- Greater emphasis needs to be given to financial self-reliance.
- Greater priority needs to be given to addressing student-centric challenges, such as jobs placement and improvement of student 'on-boarding' programs and strategies for effective linkages with the private sector.

Far-sighted and effective university leaders can play a positive role in an age of profound change. This intension and willingness to embrace change needs to be encouraged through training, coaching, mentoring and establishing supportive networks to advance their transformational journeys.

## Conclusions

The traditional and classic image of a university president is of a person of vision who often teaches courses in ethics and religion, as well as their academic field. The role of the president in this constantly evolving world has changed and has become more difficult and complicated. They are tasked with strategically developing and positioning the University to benefit from future developments and provide best possible service to the community. Consequently, as society evolves and technology advances, universities need to respond and be ahead of the curve to stay relevant and competitive.

This essential strategic objective can be realised through the tangible adaptations to their research, teaching, consultancy and community services. Evidently in the age of globalisation and a constantly evolving world, as well as topic specific expertise, society requires an understanding of other peoples and cultures. Hence, particular attention should be given to the developing of relevant graduate profiles which will produce graduates capable of being independent thinkers and problem solvers and also to ensure jobs for recent graduates.

Experience shows that whilst university presidents have the most important, difficult and evolving position at their universities, they typically have training and expertise which can be best described as 'narrow and deep' this contrasts with the skills needed for the presidential role which requires 'broad experience' across many disciplines of academia, management and finance.

These circumstances indicate that at times, universities are not paying sufficient attention to major strategic priorities due to a lack of preparedness and recognition of priorities on the part of newly appointed presidents. Consequently, newly appointed presidents require coaching and mentoring to guidance them through the initial challenges. Furthermore, boards of trustees, directors, or governors need to better prepare for their governance and strategic roles to be able to effectively guide and direct. Moreover, greater attention needs to be given to developing effective succession plans in university institutions, accompanied by appropriate professional development, to prepare potential presidents for their future roles.

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***Egyptian EFL Writers' and Instructors' Perceptions of Peer Written Feedback***

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**Abstract**

The principal aim of this study is to compare between the perceptions of peer feedback (PF) and teacher feedback (TF) as viewed by adult Egyptian L2 writers. That aim is pursued to address the lack of abundance of that line of research in Egypt, and particularly targeting adult L2 writers. Consequently, the study is guided by four research questions enquiring about general perceptions of PF versus TF, how PF and TF prioritize feedback on writing features differently, the perceptions of PF and TF uptake, and differences between genders in their perception of PF and TF. This study adopted mixed methods approach consisting of a questionnaire, multiple interviews, and writing samples. The total number of participants is 88, and 16 writing samples. The data analysis presents a considerable awareness of the importance of PF in comparison to TF. L2 writers understand the value, use and benefit from PF, but not at the same extent of using TF. Two thirds of the adult L2 writers participating in this study support the importance of training the peer on giving effective writing feedback. Furthermore, the data shows that the peer prioritizes almost the same writing features that the teacher does in their feedback. As for the perceptions of PF and TF uptake, L2 writers in Egypt believe, react, and feel motivated towards PF and TF in roughly the same way. Finally, the investigation of gender differences and the effect of that on the perceptions of PF and TF yield no significant differences quantitatively.

**Keywords:** Feedback Perceptions, Peer Feedback, Perceptions of Feedback Uptake, Teacher Feedback, Writing Features, Written Feedback

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## Introduction

Providing effective feedback contributes significantly to learning a foreign/second language (Hattie & Timperley, 2007). In a classroom setting, feedback is a tool through which the teacher guides the learners to those areas they need to improve, and as well gauges their degree of learning. Feedback also motivates learners to further improve in their learning journey (Ghani & Asgher, 2012). Noroozi et al., (2016) argued that the provision and receipt of feedback in the form of the debate and negotiation that take place between peers, for instance, lead to learning the content, and thus, constructing deeper knowledge. Feedback on students' writing—specifically—should endorse the improvement of the writing skill in L2 learning as argued by a number of researchers in the field of English language teaching (ELT), such as Min (2006), Paulus (1999), and Zhang (2008).

Comparing writing feedback, which is provided to L2 writers in a written form that is direct on all writing features, from the peer (PF) with that from the teacher (TF) has given rise to controversy for decades. The general perception that L2 writers have about feedback is that it is optimum when it is received from the teacher (Ghani & Asgher, 2012); however, some research has also looked at PF as a new practice since the 1980s (e.g., Chaudron 1977; Connor & Asenavage, 1994; Partridge, 1983). Moreover, those studies that compared students' perception of PF versus TF have gained traction and showed some interesting findings as will be discussed below.

As posited by Lindsay and Norman (1991), perceptions, in their broad meaning, are characterised by being experiences where humans deal with the data provided by their sensory systems and organize them selectively. Many studies have investigated L2 writers' perceptions of feedback. Of those studies, which concluded that the teacher's writing feedback (WF) is more favored over that of the peer, is Chen and Lin's (2009) experiment proving that preference, but the students in their sample maintained the acknowledgement of the peer's effort in correcting their mistakes. On the other hand, rejection of PF was a significant common finding in research studies done by Falchikov (1986), and Orsmond et al. (2000). In both studies, there were wide gaps in grading the same writing samples by the tutor and the peer. That disparity in grading led participants to perceive PF negatively and prefer TF. For Orsmond et al., it was apparent that learners had different perceptions and interpretation of individual marking criteria both among themselves, and between them and the tutor despite being given verbal and written training. This dichotomy of grading between the tutor and the peer caused the lack of trust of PF and rejection of it to ensue.

### 1. Earlier Studies

The research on whether PF does have advantages reports striking findings. Tsui and Ng (2000) argued that positive PF fosters more motivation for learners owing to the fact that, in their study, their participants acknowledged the low apprehension that they experienced when they discussed their writing with the peer than with the teacher. Moreover, Ghani and Asgher (2012) listed a number of advantages of the PF practice. They claimed that it makes students perform the role of a reader and a writer simultaneously, which sharpens their analytical and critical thinking skills. It also paves the way for communication to occur authentically; students explain, justify and arrange their writing, or the writing they critique, in a real communicative way. What is additionally totally unique in PF according to them is that it is immediate; clarifications sought are responded to instantly from the peer sitting in the next seat.

The analogy drawn between PF and TF has induced more research in that area. Of those researchers, some have affirmed that PF is more advantageous to learners than TF. Rollinson (2005), for instance, claimed that PF surpasses TF in a number of features. Firstly, the casual interaction that happens between peers leads to effective negotiation of meaning, posing questions, requesting clarification, and most importantly, rejecting the peer's comment altogether. In contrast, interaction with the teacher while receiving feedback is one-way; hence, the student may revise their piece of writing based on the feedback of the teacher without fully understanding the justification underlying it. A second advantage that Rollinson saw as paramount is the fact that the peer can get engaged in prolonged discussions and meaning negotiation; a conversation can extend even beyond the boundaries of a classroom, and peers can exchange resources to prove the correctness and validity of one lexical/grammatical point they are making, and this aids the positive perception of that practice. Teachers, on the other hand, do not always exercise this privilege when teaching classes that operate at full capacity. Caulk (1994) held the same view about the upside of PF, not only in large classes, but in the majority of learning settings. Caulk argued that classmates provide each other with comments on writing instantly and meticulously, and in different aspects of writing.

The results of the aforementioned studies show that there is a widening chasm. On the one hand, some research studies indicate the negative perceptions of the effectiveness of PF (Chen & Lin, 2009; Falchikov, 1986; Orsmond et al., 2000; Truscott, 1996 to mention but a few), and on the other hand, some other studies denote positive perceptions (Caulk, 1994; Ghani & Asgher, 2012; Rollinson, 2005; Tsui & Ng, 2000 to name but a few). This chasm is attributed to the discrepancy in the research methodology, the recruitment method of participants' sample and its size, and the study aim. This disparity instigates the need for further research in different countries and in diverse settings in order to establish a pattern for the effectiveness of one source of feedback over the other, or the balanced students' perception of both in facilitating the revision of students' writing.

Another perspective that has sparked the interest of researchers is the writing features that are prioritized in PF and TF. In one early study to locate any similarities between PF and TF in terms of what writing features are focused on and are advised to be revised, Nelson and Murphy (1993) reported some interesting findings that indicated that in 50% of the cases, the peer and the teacher provided feedback on the same areas.

Looking into *uptake*, it is defined by Loewen (2004) as the student's attempt to include the feedback received into their future writing draft. Loewen categorised uptake—considering the time of the students' incorporating or producing the linguistic form—into *successful* and *unsuccessful uptake*, based on the result of the subsequent drafts. Comparing the uptake that takes place after PF and TF is key to deeper understanding of uptake. Zhang (1995) carried out a study on ESL students in two American universities in which 94% of students showed more signs of uptake following TF than PF. Jacobs et al. (1998) investigation about learners' attitude towards PF and TF reported opposite results where 93% of their students voiced their liking of PF and showed higher uptake from it.

Expectations from feedback are a major factor in the uptake of feedback. Atmaca (2016) argued that perspectives of feedback that are different between the teacher and their students can result in misinterpretation of how valuable the feedback is; hence, teachers need to raise their learners' awareness of the purpose of feedback; how to react to and use it to improve

their writing skills. That early awareness, according to Atmaca, helps reshape their attitude and belief about the value of feedback.

Gender difference in peer feedback is another area of research that the current study aimed to explore. As claimed by Noroozi et al. (2020), it is an area that is under represented, and thus requires more research. In their study, Noroozi et al. explored how the gender difference variable impacts: The quality of PF provided; the difference in responses to that PF; and the extent to which they benefit from it. Using an argumentative essay task as their data collection tool, Noroozi et al. found that females provided higher quality feedback—more elaborate—than their male counterparts. Moreover, no difference was recorded between both genders in terms of benefiting from PF.

## **2. Research Gap**

By sifting through the literature of PF effectiveness and acceptance or rejection by learners, one will find a commonality between many research papers. Many of those researchers, looking into the viability of PF, urge other researchers in different countries and in different instructional settings to conduct more research into that area. They presume that the findings of research may change with learners of other nationalities, age groups and settings of educational instruction. That assumption is supported by Chen et al. (2016) who observed that the EFL practices in developing countries are not included significantly in the international literature of that area, and that the EFL classes require their own unique research studies.

In Egypt, more studies are needed to compare between PF and TF as perceived by the age group of adult learners—who do general English language courses to boost their proficiency level for some personal, academic or professional reasons. This research problem has prompted some Egyptian researchers to scrutinize the influence of PF on students in higher education institutes. Their main research objective has been to gauge the effect of feedback from the peer and what features of language PF generally focuses on. For example, Shaalan (2017) recommends that more studies be carried out in the Egyptian context, especially to investigate whether (a) the proficiency level of the peer, and (b) the quality of the feedback have an effect on the learner's decision to use the peer's feedback. Therefore, this study worked towards deeper exploration of the perception of feedback of adult L2 writers.

## **3. Research Questions**

This study aimed at exploiting a certain sector of L2 learners in Egypt. The study primarily focused on those adult learners taking general English language courses in different proficiency levels, and who study general English for diverse goals. The sample of participants, who were selected by convenience sampling, are adults L2 learners doing general English courses at the School of Continuing Education (SCE), at the American University in Cairo (AUC). Scrutinizing their perception of PF and TF in this research study has had far-reaching implications for adult classroom practices. Two specific areas are of interest in this context, namely the field of research and classroom practices. Firstly, as mentioned in an earlier section, more studies of L2 classes, and the perceptions about PF and TF of especially adult professionals learning English language in Egypt is an area requiring further research. Secondly, the results of this study can enlighten educators about how that age group of learners perceives PF in comparison to TF; thus it could help the L2 teacher in



the decision to incorporate PF in their teaching practice if found to be of significance and value to them.

This current study aimed to explore (a) what adult Egyptian L2 writers believe regarding receiving feedback from their peer versus from their teacher, (b) what writing features are mostly prioritized in the PF versus those in the TF, (c) the uptake of PF versus TF, and lastly (d) gender differences in the perceptions of PF versus TF. The research questions (RQs) compiled for this study are:

RQ1: What are adult Egyptian L2 writers' perceptions of peer and teacher feedback?

RQ2: According to adult Egyptian L2 writers', which writing features do both peers and teachers focus on/prioritize?

RQ3: What are adult Egyptian L2 writers' perceptions of uptake of the writing feedback received from peers versus that received from teachers?

RQ4: To what extent do female and male L2 writers perceive PF and TF differently?

#### **4. The Sample of Participants**

The sampling strategy adopted in this research study was the nonprobability sampling (Creswell, 2003). In nonprobability sampling, both convenience sampling and snowball sampling were utilized to collect data. The sample was a group of 81 mixed gender adult L2 learners, enrolled in general English language courses at the SCE of AUC. The participants, mostly the researcher's former students, practiced peer feedback activities in the course of their learning at the SCE; however, students at the LD do not receive official training on PF; they receive instructions from their instructor to provide holistic feedback, or to provide feedback targeting a certain writing feature in accordance with the lesson's learning outcome. For the purpose of this study, only participants' holistic feedback was utilized for data analysis.

The participants were all 18 years old or above. Some were senior high school students, some university students, and some were working professionals. Hence, adults of diverse educational, socioeconomic, and cultural background took part through the data collection instrument that was electronically sent to them directly by the researcher. The researcher disseminated one of the research instruments through virtual groups on one of the well-known multiplatform messaging mobile phone applications (i.e., WhatsApp).

#### **5. Data Collection Instruments**

The data collection instruments employed in this study were three different tools. The researcher used (a) a questionnaire comprising 35 items of different question types, and adapted from previous studies to enquire about the general perceptions of PF and TF, the perceptions of PF and TF uptake, and the impact of gender on those perceptions; (b) a face-to-face interview on an online meeting platform, containing seven questions to investigate qualitatively the general perceptions of PF versus TF, the writing features that L2 writers found to be the most focused on in PF and TF, and the differences in how genders perceive PF and TF; and (c) 16 writing samples from three various proficiency levels to discover the difference in what PF focused on as opposed to TF.

## 6. Data Analysis Techniques

The responses collected from the questionnaire were exported to an MS Excel spreadsheet and coded for data analysis. For single-answer multiple choice items, each answer was given a code from 1 to 3 for the three-choice item, and from 1 to 4 for the four-choice one. On the other hand, questionnaire items allowing for checking more than one answer were binary coded, where (0) meant that an answer was not checked, and (1) meant that it was. Frequency, *t*-tests, and Chi-square tests were run on the data through SPSS statistical software, version 23. The values of the mean, standard deviation, mode and *p*-value were calculated to obtain the study results.

The responses of interviews were treated differently. In total, seven learners were interviewed: three males and four females in two proficiency levels (i.e., B1 and B2), age groups, and educational backgrounds. The digital files of the recorded interviews from the online meetings were exported to electronic transcription software to generate transcribed interviews. The transcription of interviews was reviewed to remove interjections and mannerism, and to adjust verb conjugations. Following that, the transcription of all seven interviews was exported to an MS Excel spreadsheet to spot the patterns of answers and the commonality within each question of all seven learners. Codes were then established within which the answers were categorised.

As for the writing samples, the researcher collected 16 writing samples produced during writing in-class tasks done by the SCE's LD learners. The writing samples were from A2, B1 and B2 learners who collaborated to write essays of different lengths. Each sample was in two copies: one was corrected by the peer and the other by the researcher himself. The feedback was categorised into eight categories: vocabulary, grammar, punctuation, linking, coherence, capitalization, prepositions, and spelling. The feedback under each category was manually counted once in the peer copy and another in the researcher copy.

## 7. Delimitations of the Study

Ideally, research studies have delimitations. Firstly, this current research focused exclusively on adult Egyptian L2 learners, i.e., senior high school students, university students, and graduate learners from all educational, and professional backgrounds. Secondly, the study comprised participants who mostly have common socioeconomic standard as they all study general English at AUC. The study lastly examined one classroom practice of L2 teaching in Egypt: Receiving written feedback only, and not the oral one, from a classmate and how that was perceived.

## Conclusions

### 1. General Perceptions of PF Versus TF

The first research question that this study was designed to investigate was the general perceptions of peer feedback in comparison to teacher feedback. The study participants believed in the importance of TF slightly more than PF. They praised TF as being more accurate, more systematic as it followed a rubric, and more reliable as the teacher is well trained to provide structured feedback that targets the core of the error. Consistent with the literature, this finding aligns with Tsui and Ng's (2000) study and with that of Yang et al.'s (2006). L2 writers did not believe that PF was more important; however, some of them were

of the opinion that both were equally valuable in the course of improving their writing. That was also evident through the interviews as the responses pointed out balanced views of both feedback types.

The perceptions of the peer's ability to give feedback were enquired about in this study. The views were almost neutral, and this is a general indication that the absolute confidence in PF is still lacking. In addition, interviewees believed that the peer was not qualified to give feedback as the peer tended to provide superficial comments, not targeting the core of the writing process. Moreover, provided that some peers were not careful with their choice of words when providing PF, some negative comments would be discouraging to some writers; and some peers tended to be adamant that their feedback was correct without showing tolerance towards other opinions.

In addition to the above, the acceptance and use of PF and TF were also investigated. As illustrated in Figure 1, acceptance of TF was slightly higher than PF. The results showed that, while L2 writers *always* accepted their teacher's feedback, and *always* used it to improve their writing proficiency, the acceptance of peer feedback was *often*, and they *sometimes* used it.

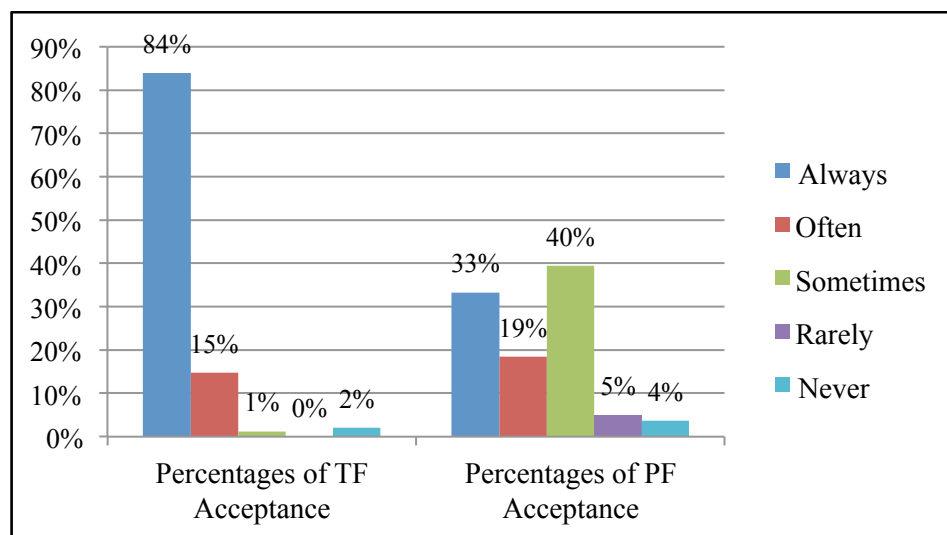


Figure 1: The Difference in TF and PF Acceptance by L2 Writers

However, when asked whether they would discuss the feedback after receiving it from their peer or their teacher, L2 writers had the same opinion regarding both types (as demonstrated in Figure 2), and their choices oscillated between *often* and *sometimes*. This could indicate a prevalent behaviour of not discussing the feedback received. This can be also explained in the same way that Zhao (2010) explained their research outcome by saying that some learners were unwilling to challenge the teacher, and to investigate more about the error in question (due to the conventional dominant role of the teacher that many students believe in).

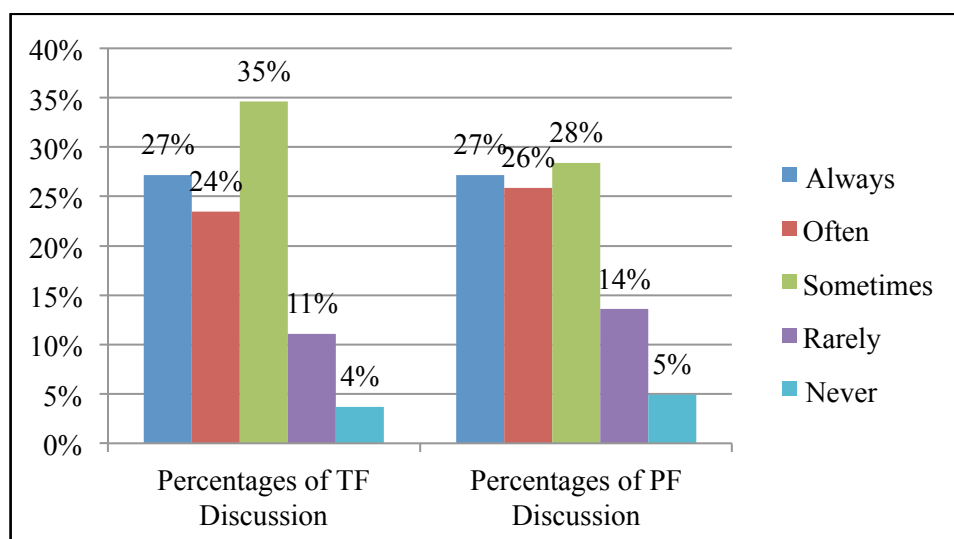
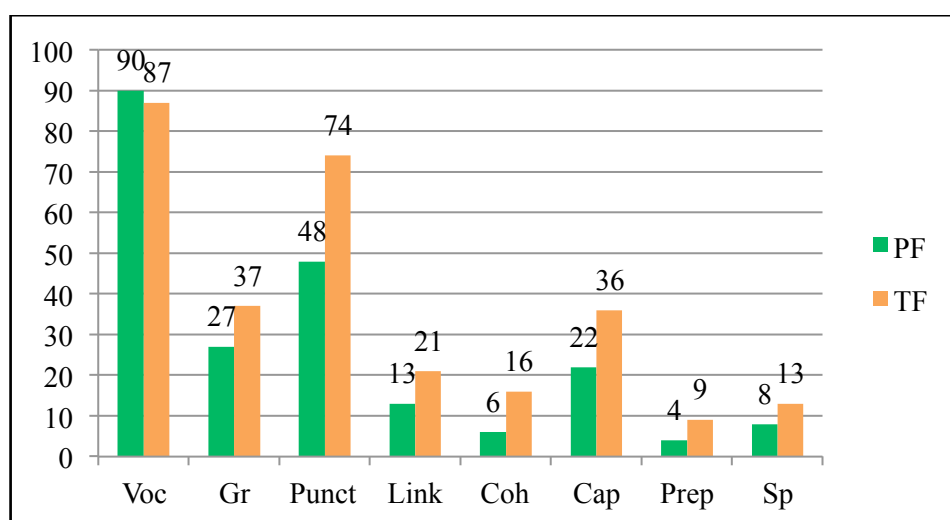


Figure 2: The Difference in TF and PF Discussion by L2 Writers

## 2. The Peer's Versus The Teacher's Prioritization of Writing Features in Feedback

The second research question was frames to compare between the peer and the teacher from the perspective of what they focus on in their feedback provision. To locate those writing features that both parties prioritize, the sample of L2 writers were interviewed, and writing samples from real in-class tasks were analysed.

As mentioned earlier, 16 writing samples from A2, B1 and B2 levels were garnered for this study. Each writing sample was in two copies: One for the peer and one for the teacher (i.e., the researcher) to provide feedback. A count of the instances of errors was carried out for each of the two copies to pinpoint how PF and TF differed in their focus of feedback attention. As illustrated in Figure 3, PF and TF focused on the same writing features.



*Note.*  $N = 16$  samples; Voc = Vocabulary; Gr = Grammar; Punct = Punctuation; Link = Linking; Coh = Coherence; Cap = Capitalization; Prep = Preposition; Sp = Spelling

Figure 3: The Count of Error Instances of Eight Writing Features as Highlighted in PF Versus TF

This finding was also reported in Nelson and Murphy's (1993) research that indicated that in 50% of the cases, the peer and the teacher provided feedback on the same areas.

Therefore, the peer's ability to highlight errors was palpable, and the similarity between the prioritization of both parties was significant. This further implies that PF has the potential to be as valuable as TF provided that the peer was trained adequately on that.

### **3. The Effect of Beliefs on Learner Uptake of PF Versus TF**

The third research question tackled the uptake of PF and TF. Referring to the literature of uptake and its relation with L2 learners' beliefs about feedback, Storch and Wigglesworth (2010) stated that "research that looks more closely at how learners' beliefs and goals impact their decisions is needed to understand how and why learners respond to different forms of CF [(classmate feedback)]" (p. 304). Interestingly in this study, while more L2 writers believed that the teacher was always right and that the TF they received highlighted errors that were new for them to know about, they were inclined towards rejecting PF that did not match the previous knowledge they already had about the language. This specific finding supports evidence from previous research, such as that of Hyland (1998) who reported learners' rejection of feedback that contradicted with previous knowledge that they had about the language. On the contrary, a very small number of participants believed that both PF and TF were not needed as errors would be corrected by more practice and time. Those results represent some beliefs in the value of PF because both PF and TF recorded the same mean value when asked to choose whether there was no need for PF and TF.

### **4. Reactions Towards PF and TF**

The second factor playing a role in the uptake of feedback is how L2 writers reacted towards PF versus TF. Two items in the questionnaire examined reactions, and asked participants whether they read carefully the feedback they received for the purpose of incorporating it in future writing tasks, or they did not generally use it. The data analysis recorded no significant difference between PF and TF with respect to that factor. However, the mean value showed slight numerical difference indicating that PF is marginally behind TF in that respect. The participants' choice of reading TF carefully for future use was more conclusive than the choice of reading PF carefully, but the difference in percentages was quite minimal (i.e., 88.6% TF, and 80.5% for PF). This finding is consistent with Wu's (2006) study finding: Wu reported that both sources of feedback generated the same results in a study focusing on L2 adult learners, i.e., learners' reaction towards both PF and TF on their writing composition was similar.

### **5. The Role of Motivation in the Uptake of PF and TF**

The uptake of feedback relies on the level of motivation of L2 writers. Two items gauged how motivated and encouraged to write better the participants felt after receiving PF and TF. Interestingly, both items scored the same percentage (81%), which indicated a high level of motivation and encouragement to incorporate the feedback received from either the peer or the teacher in future writing tasks (The *t*-test showed no significant difference between PF and TF in that respect). The results of these two items also provide supporting evidence that PF is gaining traction and is considered as valuable as TF. Two more items, looked into motivation, and investigated the effect of encouraging commentary, such as *good job*, *well done*, and *excellent*, on the uptake of PF and TF. The percentage of choice of TF (97.5%) showed stronger tendency towards the option that reflected their motivation to do better in

future tasks. In contrast, PF recorded a different percentage (82.7%), and that indicated a slightly less ability for those positive commentary phrases to motivate L2 writers. A possible interpretation of those results can be the fact that those phrases of motivation are typically expected from the teacher, and are inherently a part of their notion of feedback from the teacher, and not from the peer.

## 6. Gender Differences and the Perceptions of PF and TF

The last research question in this research study aimed at exploring any differences in how male and female L2 writers perceive PF and TF. No significant differences between males and females were recorded in (a) their general perceptions of PF and TF, (b) the writing features they perceive to be prioritized by the peer or by the teacher, and (c) their perceptions of uptake of PF and TF. Those balanced perceptions of PF and TF broadly support the view of Noroozi et al. (2020) who found that females and males benefitted similarly from feedback. For instance, Figures 4 and 5 below illustrate the results of two questionnaire items, indicating no significant difference between female and male participants.

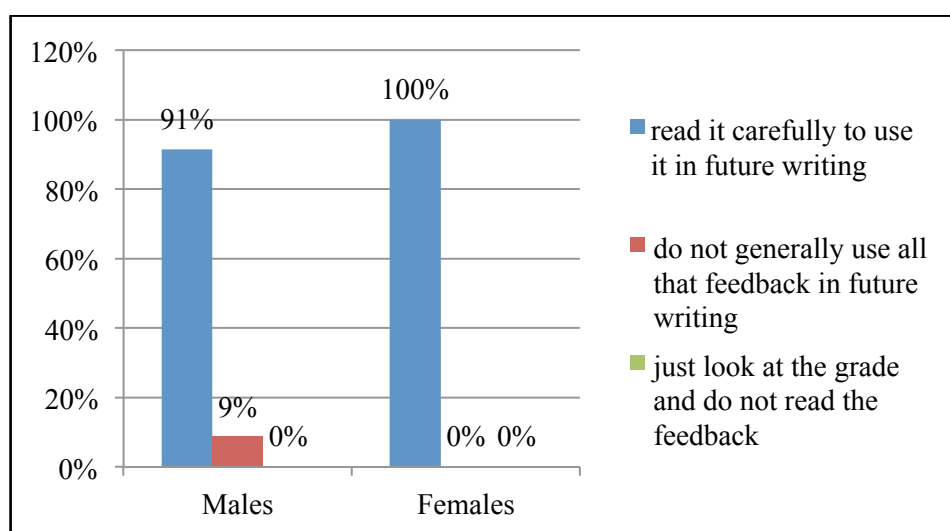


Figure 4: L2 Writers' Gender Difference in Terms of Using TF in Future Writing

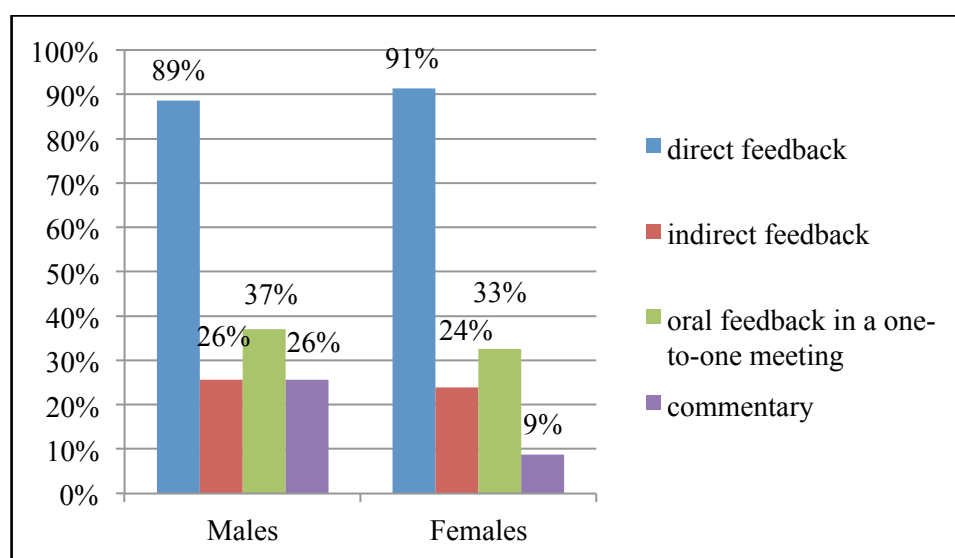


Figure 5: L2 Writers' Gender Difference in Terms of TF Type

Although the quantitative data suggested no significant gender differences, the qualitative data, collected through one-to-one interviews, illustrated otherwise. Females and males reported diverse responses to that question. Although female participants generally were of the opinion that L2 writers perceive feedback differently owing primarily to personality differences and not to gender, males' perspective was that the gender factor did make a difference in that respect. The reason for this is not quite clear, but it may be due to what males feel innately that they are more flexible and tolerant to feedback and critique than females. As one participant responded: "Females are not flexible in accepting feedback. However, males have toleration because they face a lot of situations so they can be flexible." It could be that females do not innately feel the same.

## **7. Study Implications**

Following the analysis of the data, presenting the results, and putting plausible interpretations on those results, it is essential to study how those results can impact teaching practices. The study carries implications of use that L2 educators and all concerned stakeholders can benefit from.

The most obvious finding to emerge is that there is a noticeably high level of awareness among L2 writers of the importance of PF. This is a positive outcome for L2 educators as having a considerable level of acceptance of PF among learners means that they are prepared to become more autonomous, and they prove to be increasingly willing to interact and exchange knowledge.

Furthermore, the results of this research imply that learners can benefit from PF to become better writers. As posited by Liu and Carless (2006) and Yu and Lee (2014), more consistent practice of PF can give impetus to the quality that L2 writers provide in their writing, and can encourage them to exert more effort when they know that their piece of writing will be reviewed by the peer.

Upon realizing that awareness of peer feedback is increasing, and that the gap between it and TF is becoming narrower, curriculum designers—a major stakeholder—can potentially include writing practice activities that encompass L2 writers critiquing each other's production. Furthermore, they can allocate sections in language textbooks for the teacher to train learners on how to give peer feedback through activities that the teacher performs with learners to engage them in the practice.

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***A Bird's-Eye View of Curriculum Publications Concerning Seven Countries:  
A Bibliometric Analysis***

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**Abstract**

This study reports a bibliometric analysis providing a bird's-eye view of publications on curriculum pertaining to Australia, South Africa, Ethiopia, Kenya, Ghana, India and Estonia. Bibliometric analysis enables an overview of the scholarly production within a field. Systematic searches of the Scopus database were conducted to identify relevant peer-reviewed journal articles, and their bibliometric data were extracted. Bibliometric analysis was used to identify how much has been published on curriculum pertaining to the above countries over the past two decades (2000-2021), where such works were conducted, and in which journals they were published. Next, co-occurrence maps of author-defined keywords were created to identify the main topics that are addressed in curriculum publications within the last five years (2017-2021). Results showed that much more research pertains to Australia, South Africa and India compared to the other countries. The number of publications for these three countries increased while those concerning Ethiopia, Ghana, Kenya and Estonia remained low. Most works concerning a given country have been conducted within that country, and much work was conducted within US and UK institutions. The number of journal titles within which the publications appeared is vast. Findings also showed that a great proportion of curriculum publications relate to higher education and the medical field. In addition, topics such as decolonisation and indigenusness appear to be relevant in contemporary educational debate. Potential reasons underlying the findings and implications for moving curriculum research forward will be discussed.

Keywords: Curriculum, Publications, Bibliometric Analysis

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## Introduction

This research used bibliometric analysis to provide an overview of the landscape of publications on curriculum concerning the countries Australia, South Africa, Ethiopia, Kenya, Ghana, India and Estonia. These seven countries were selected because they are of interest to the author's institution rather than a specific theoretical rationale. Bibliometric analysis can be defined as 'the quantitative analysis of the bibliometric features of a body of literature' (Hawkins, 2001). Bibliometric features include author names and affiliations, article titles, abstracts, keywords and number of citations. The purpose of such an analysis is to provide an overview of the scholarly production within a given field of study, in this case curriculum scholarship, and to determine the structure of that field. This can help to identify themes and patterns in the literature, changes in production over time or the growth of literature, as well as to find the most prolific authors, institutions, countries and journals within a field. Other uses include the identification of patterns of collaboration amongst scientists as well as the impact of journals (De Bellis, 2009; Garfield, 2006 as cited in Blažun et al., 2012). The results of bibliometric analyses are often visualised in science maps. These are visual representations of the relationships between different bibliometric units such as keywords, author names and journal titles.

This paper first provides a general overview over the past two decades of curriculum publications concerning the seven countries based on the analysis of metadata of peer-reviewed journal articles. Analysing how much has been published, where the work was conducted, and in which journals such work was published can help to identify the key players or research hotspots in the curriculum field. Next, the key topics in publications on curriculum over the past five years were identified based on the analysis of article keywords. This can increase awareness of the important areas of contemporary academic curriculum debates.

The following research questions (RQs) were addressed:

- 1) What is the landscape of curriculum publications concerning the countries Australia, South Africa, Ethiopia, Kenya, Ghana, India and Estonia over the past two decades (2000—2021)?
  - a. How much has been published over time?
  - b. Where has this work primarily been conducted (i.e., What are the most frequent countries of author-affiliation)?
  - c. In which journals have these publications been published most frequently?
- 2) What are the key topics in publications on curriculum pertaining to these countries over the past five years (2017—2021)?

## Method

### Sample and procedure

The research questions were answered through bibliometric analysis using the free software VOSviewer (Van Eck & Waltman, 2013). To create the dataset, I searched the abstract and citation database Scopus, which is the largest database of its kind. It has a curated collection of peer-reviewed journal articles, which ensures the quality of the included documents. Scopus only includes articles from journals that are published regularly, have a publicly available publication ethics and malpractice statement, and have English language abstracts

and titles. While quality assurance is essential, the inclusion criteria of the database may exclude potentially relevant articles, such as those published in languages other than English. Several searches of the Scopus database were conducted with the following criteria:

- ‘Curriculum’ appears in the article title OR author-defined keywords
- AND ‘[Name of the country]’ appears in the article title OR abstract OR author-defined keywords (note that a separate search was conducted for each of the seven countries)
- AND the documents were published between 2000—2021 (for RQ 1) / AND the documents were published between 2017—2021 (for RQ 2) (note that for RQ 1, one search was conducted for each year and each country separately and another search was conducted for each country including the entire period 2000—2021)
- AND the documents were limited to articles and reviews
- AND the documents were limited to journals.

The search resulted in the document base presented in Table 1.

Country	2000—2021	2017—2021
Australia	1175	427
South Africa	600	286
Ethiopia	45	22
Kenya	90	37
Ghana	53	24
India	384	207
Estonia	37	10

Table 1: Number of documents included in the database per country.

The metadata belonging to these documents were exported as Comma Separated Values (csv) files, which was read and, if necessary, adapted in Microsoft Excel. The data were cleaned to correct mistakes such as incorrect couplings between institutions and countries and incorrect journal titles and author-defined keywords, which were mostly due to formatting issues. In addition, VOSviewer thesaurus files have been created to replace the plural form of keywords with their singular form and to turn American English spelling into British English spelling. This ensured that the same keywords would be recognised as being the same despite their different spelling.

## Analysis

### Research Question 1

To examine how much has been published on curriculum pertaining to each of the seven countries over the past two decades (RQ 1a), the number of publications for each year and country were entered into Excel. A scatter graph was then created. To identify the most frequent countries within which the works were conducted (RQ 1b), the metadata for publications between 2000—2021 were imported into VOSviewer for each of the seven countries separately. A frequency count for the countries of author-affiliation was obtained by creating co-authorship maps<sup>1</sup>. Note that the co-authorship network illustrated in the maps

<sup>1</sup> Such a map visualises the relatedness of different units (authors, organisations or countries), whereby the relatedness of items is determined by their number of co-authored documents.

themselves was not of interest. To identify the most frequent journals within which these publications appeared (RQ 1c), the same metadata was used to create citation maps<sup>2</sup> in VOSviewer. The maps were used to obtain the frequency count for each journal title.

## Research Question 2

To identify the important areas of contemporary academic curriculum debates concerning the seven countries, co-occurrence maps based on author keywords have been created. A keyword co-occurrence map, together with the exact number of occurrences provided within the interactive software, can show the total number of publications within which a keyword occurred as well as the number of publications within which two keywords occurred together. Thus, the analysis can show the most frequently occurring topics, or hot spots, within publications on curriculum.

To create the maps, the following steps were taken within VOSviewer for each country:

- Importing the csv file containing the metadata for publications between 2017-2021 as well as the thesaurus files into VOSviewer.
- Selecting *Co-occurrence* as the type of analysis and *Author keywords* as the unit of analysis using the *full counting method*. The full counting method means that each co-occurrence link between two keywords has the same weight.
- Selecting the minimum number of occurrences of a keyword. That is, determining in how many publications a given keyword needs to appear at least (i.e., the threshold) in order to be included in the map. Note that this number differed between countries as using the same threshold for countries with very different numbers of publications leads to either a) a selection of too many keywords and thus illegible maps (for those with large numbers of publications) or b) very few or even no selection of keywords (for those with very small numbers of publications). The selected threshold will be made explicit in the results.
- Selecting the number of keywords that will be presented in the map. Here, the total number of remaining keywords was selected for each map.

## Results and Discussion

### Research question 1

This report first sought to examine how much has been published on curriculum pertaining to Australia, South Africa, Ethiopia, Kenya, Ghana, India and Estonia over the past two decades. Figure 1 depicts the number of publications between 2000—2021 for each of the seven countries (also see Table 1). It becomes immediately clear that the research output differs vastly between countries. Publications concerning Australia are most frequent, followed by South Africa and India. The numbers of publications concerning Ethiopia, Kenya, Ghana and Estonia are small and relatively stable over time. In contrast, there is an increase in publications pertaining to Australia (from 9 to 114), South Africa (from 3 to 75), and India (from 2 to 70) over time.

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<sup>2</sup> Such a map visualises the relatedness of different units (documents, sources, authors, organisations or countries), whereby the relatedness of items is determined by the number of times they cite each other.

It would have been plausible that publications on curriculum spike in times of curriculum reform when the interest in curriculum matters might be the strongest. However, the current analysis does not indicate such trends. There are no notable spikes in publications, except perhaps for South Africa in 2014 ( $n = 58$ ). This coincides with the year in which the new National Curriculum Statements were implemented in the Senior Phase and Grade 12. However, there were no spikes in years when they were implemented in other stages of Education, such as the intermediate phase and Grade 11 in 2013. This suggests that this was a coincidence rather than that the number of publications increased because of the implementation. The steady growth of publications, at least for some of the countries, is in line with the general global trend of increased numbers of publication over time. The numbers of publications referenced in Scopus are generally increasing over time (Johnson et al., 2018). Hence, the increase in curriculum publications may not reflect an increase in interest for the field specifically.

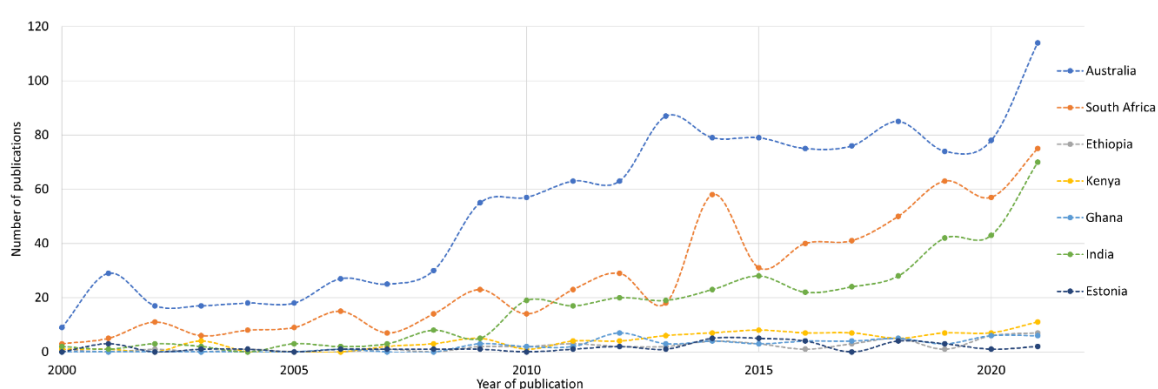


Figure 1: The number of publications on curriculum between 2000—2021 by country.

Why might the number of publications vary considerably between countries? Rather than assuming that these trends reflect differences in curriculum interest, it seems plausible that differences in resources for research into curriculum matters might explain the findings. Research productivity in terms of number of publications is linked to the wealth of a country (Jaffe et al., 2020). Here it becomes important to look at the countries within which the work was conducted. Table 2 provides this overview. It is clear, and unsurprising, that most authors are affiliated with institutions within the countries that the publications pertain to. These countries differ in their GDP per capita (in current US dollars) as well as their research and development expenditure (in % of GDP; The World Bank, 2022). In 2020, the GDP per capita was highest in Australia (51,692.8), followed by Estonia (23,027.0), South Africa (5,655.9), Ghana (2,205.5), India (1,927.7), Kenya (1,878.6) and Ethiopia (936.3). A similar picture is painted by their research and development expenditure, which is highest in Australia (1.87 as of 2017), followed by Estonia (1.40 as of 2018), South Africa (0.83 as of 2017), Kenya (0.79 as of 2010), India (0.65 as of 2018), Ghana (0.38 as of 2010) and Ethiopia (0.27 as of 2017). Countries with less resources tend to publish less. Hence, it seems particularly relevant to invest into curriculum research in countries that have less resources in order to support the development of successful curricula. Another potentially more cost-effective approach could be to invest into the development of international curricula that can be adapted to different nations or contexts (for example see the Cambridge international curriculum<sup>3</sup> and Fitzsimons et al., 2020).

<sup>3</sup> See <https://www.cambridgeinternational.org/why-choose-us/benefits-of-a-cambridge-education/international-curriculum/>

Interestingly, the number of publications for India and Estonia do not seem to follow the pattern whereby the number of publications is linked to resources as publications are fewer than one might expect for Estonia and higher for India. One possible explanation for this unexpected pattern could be the language of publication as Scopus only features journals that have an English title and abstract. The countries within which most of the included publications are conducted (Australia, South Africa and India) are also those that have English as one of their national languages. Accordingly, results might be biased towards countries where more publications are in the English language.

	1	2	3	4	5
Australia	Australia (1017)	UK (76)	New Zealand (57)	US (56)	Canada (36)
South Africa	South Africa (526)	US (39)	UK (27)	Australia (24)	Canada (9)
Ethiopia	Ethiopia (29)	US (8)	UK (5)	Canada (4)	South Africa (3)
Kenya	Kenya (54)	US (34)	South Africa (11)	UK (5)	Canada (4)
Ghana	Ghana (37)	US (10)	Netherlands (8)	South Africa (5)	UK (4)
India	India (294)	US (58)	UK (16)	Australia (13)	Canada (9)
Estonia	Estonia (27)	Finland (6)	Denmark (2), Germany (2), Italy (2), Sweden (2)		

Table 2: Top 5 countries of author-affiliations for publications by country (2000—2021).

*Note.* Numbers in parentheses indicate the number of publications with a given country of author-affiliation. US = United States, UK = United Kingdom.

As already mentioned, most authors of curriculum publications pertaining to a given country are affiliated with institutions within that country. But the number of countries of author-affiliations also show that such works are conducted across the globe. Publications concerning India had 55 different countries of author-affiliation, followed by South Africa (53), Australia (50), Kenya (32), Ethiopia (24), Estonia (20) and Ghana (19). Collaborations within the curriculum field thus reach across the world.

It also becomes clear that there are some ‘key players’ in the field, that is, countries within which a lot of work is produced which does not directly concern the country itself. The United States and the United Kingdom appear most frequently in the Top 5. In fact, they are amongst the Top 5 countries of author-affiliations of each country except for Estonia. Reasons for why the USA and UK appear frequently in the Top 5 presumably include that they have a relatively high GDP per capita as well as research and development expenditure (41,059.20 and 1.7 for the UK; 63,593.40 and 2.83 for the USA, respectively) (The World Bank 2022a, 2022b). The USA rank 12<sup>th</sup> and the UK 30<sup>th</sup> for GDP per capita in the world. In addition, publications from these countries are likely to have English language titles and abstracts and are thus more likely to be included in Scopus. The same is true for Australia, which also appears relatively frequently in the Top 5 for publications, specifically for Australia, South Africa and India. Another reason might be that many universities in the USA and UK belong to the best in the world, which presumably produce more and higher quality publications, relatively speaking. Just under half of the top 100 universities in the world are in the USA (with 26 universities) or the UK (18) (Quacquarelli Symonds, 2022). The fact that the USA and UK do not seem to publish as frequently on curriculum concerning Estonia



might be another reason for the relatively low number of curriculum publications for that country. This lack of involvement seems particularly interesting because Estonia is a high performing country.

Moving on RQ 1c, the Top 5 journal outlets within which the publications appear are presented in Table 3. Similar to the number of countries of author-affiliation, the numbers of different journal titles publishing these works are high. Curriculum publications concerning Australia appeared in 514 different journals, followed by South Africa (307), India (267), Kenya (68), Ghana (47), Ethiopia (37) and Estonia (29).

	1	2	3	4	5
Australia	Curriculum Perspectives (32)	Nurse Education Today (21)	Curriculum Journal (20)	Australian Journal of Teacher Education (16)	Journal of Curriculum Studies (15)
South Africa	Mediterranean Journal of Social Sciences (31)	African Journal of Research in Mathematics, Science and Technology Education (30)	South African Journal of Education (22)	Perspectives in Education (20)	Education as Change (16)
Ethiopia	BMC Medical Education (4)	International Information and Library Review (3), International Journal of Educational Development (3)		Mediterranean Journal of Social Sciences (2)	various
Kenya	Educational Research and Reviews (7)	International Journal of Educational Development (6)	various		
Ghana	BMC Medical Education (3)	Accounting Education (2), Curriculum Inquiry (2), Journal of Curriculum Studies (2), Nurse Education in Practice (2), Sage Open (2)			
India	Journal of Clinical and Diagnostic Research (12)	Journal of Engineering Education Transformations (10)	Indian Journal of Physiology and Pharmacology (9)	Indian Journal of Pharmacology (7)	Medical Journal Armed Forces India (6)
Estonia	Journal of Curriculum Studies (5)	Early Child Development and Care (3)	Education 3-13 (2), Estonian Papers in Applied Linguistics (2)		

Table 3: Top 5 journals within which publications on curriculum appear (2000—2021).

*Note.* Numbers in parentheses indicate how many publications appeared in a given journal.

The Top 5 journal titles for the selected countries suggest that these focus on three main topic areas: *curriculum* (e.g., Curriculum Perspectives, Journal of Curriculum Studies, Curriculum Inquiry), *medicine/pharmacology/nursing* (e.g., BMC Medical Education, Nurse Education Today, Indian Journal of Pharmacology) and *education* (e.g., Educational Research and Reviews, Perspectives in Education). There is no particular journal that immediately stands out across countries but there are a few journals that appear in the Top 5 of more than one country. These are the Journal of Curriculum Studies (Estonia, Australia and Ghana), the

International Journal of Educational Development (Ethiopia and Kenya) and BMC Medical Education (Ghana and Ethiopia).

## Research question 2

This next section presents findings for the question of what is being published on curriculum concerning Australia, South Africa, Ethiopia, Kenya, Ghana, India and Estonia over the past five years (2017—2021). This can help to identify important areas of contemporary curriculum debate.

The figures below show the keyword co-occurrence maps for the seven countries of interest. As explained in the VOSviewer manual, the size of the nodes and words depend on the number of occurrences of a keyword – the greater the number of occurrences, the larger the size. The distance between two nodes represents the strengths of their relationship – the shorter the distance, the stronger the relationship. This is also reflected in the lines connecting two nodes – the thicker the line, the stronger the relationship. The strength of a relationship is based on the number of co-occurrences. VOSviewer automatically forms clusters, which are sets of closely related nodes. These clusters are represented by colours. Each keyword can only belong to one cluster but does not have to belong to any cluster at all. Note that some nodes may not be labelled when saving an image of the maps but that these can be viewed in the interactive map within the software.

### Australia

The publication sample for Australia included 427 journal articles, which contained a total of 1314 author-defined keywords after cleaning. The threshold of occurrence was set to 5, which was met by 40 keywords. These are depicted in Figure 2. The keywords that occurred most frequently next to *curriculum* (n=184) and *Australia* (n=46), are *education* (n=45), *pedagogy* (n=21) and *higher education* (n=19). It can thus be said that pedagogy and higher education are frequent topics of interest in curriculum research pertaining to Australia. There are six clusters. The largest cluster in terms of the number of included keywords (in red) contains 11 keywords such as *health and physical education*, *teacher education*, *policy* and *inclusive education*. The map shows that topics related to the medical domain, including nursing and dentistry, are particularly prevalent.

Examining the map together with the metadata obtained from Scopus points towards an important caveat of using bibliometric analysis which is important to be aware of when interpreting the maps. Namely, VOSviewer only counts identical keywords together which can result in misleading conclusions. For example, the keyword *assessment* occurs only seven times in the map. Based on this low number, one might assume that assessment does not play an overly important role in curriculum publications in Australia. However, a closer examination of the actual keywords within the excel file exported from Scopus shows that this conclusion would be misleading. In fact, ‘assessment’ appeared in 18 publications but because of variations of keywords, not all instances were counted together. Examples include the keywords *formative assessment*, *assessment for learning*, and *assessment moderation*. Thus, assessment was a more important topic in curriculum publications than the map suggests. The same is true for the topic of ‘indigenous’, which appeared 8 times in the map. When examining all keywords in the metadata, there are 29 instances of ‘indigenous’, making it one of the most important keywords. Keywords include *indigenous health*, *indigenous perspectives*, *indigenous knowledge* and *indigenous control*.

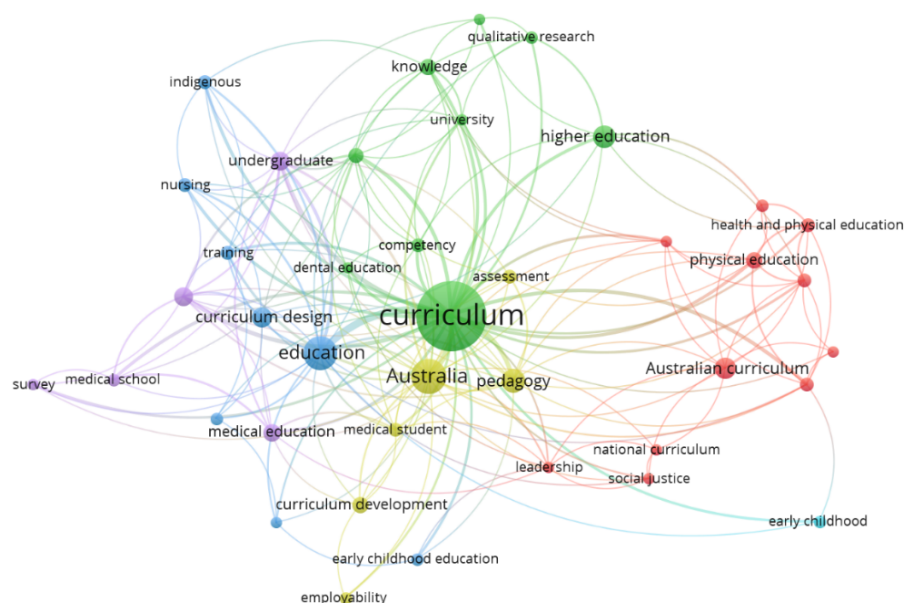


Figure 2: Keyword co-occurrence map of curriculum publications pertaining to Australia between 2017—2021.

### South Africa

The publication sample for South Africa included 286 journal articles, which contained a total of 1029 author-defined keywords. The threshold of occurrence was set to 5, which was met by 25 keywords. These are depicted in Figure 3. Keywords that occurred most frequently next to *curriculum* ( $n=95$ ) and *South Africa* ( $n=51$ ) are *decolonisation* ( $n=33$ ), *curriculum development* ( $n=19$ ), *education* ( $n=17$ ) and *higher education* ( $n=17$ ). Thus, similar to Australia, many publications appear to focus on higher education. Decolonisation seems to play a central role as does the topic of indigenouness. The keywords form five clusters. The largest cluster (in red) includes keywords such as *culture*, *diversity*, *entrepreneurship education*, *policy* and *indigenous knowledge*.

There are interesting differences between topics pertaining to Australia and South Africa. For instance, the keyword *entrepreneurship* does not appear at all in publications concerning Australia. One reason why this seems to be a topic of interest in South Africa might be the severe problem of unemployment. South Africa has one of the highest rates of unemployment worldwide, and entrepreneurship has been proposed as one way to tackling this problem (see Du Toit, 2020). Another difference to Australia is that the medical field does not seem to play as important a role.

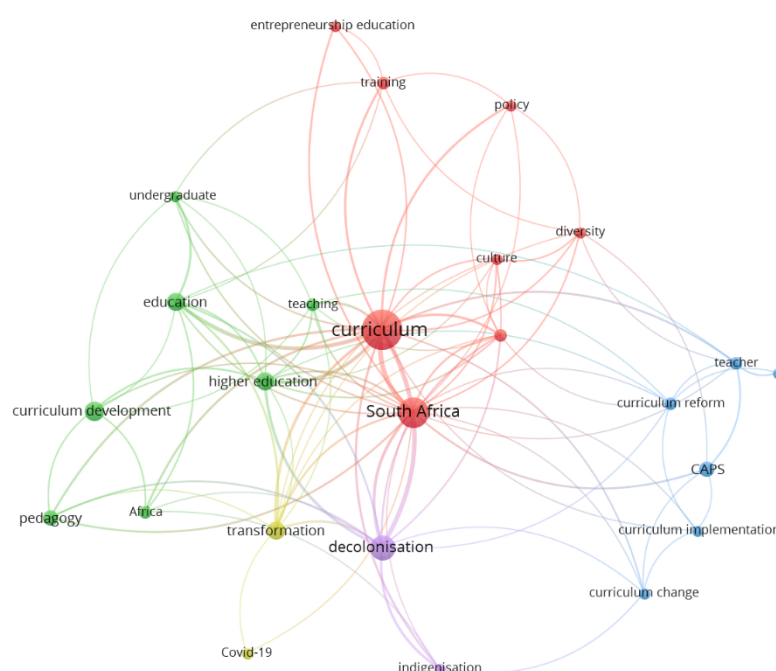


Figure 3: Keyword co-occurrence map of curriculum publications pertaining to South Africa between 2017—2021. CAPS = Curriculum and Assessment Policy Statement.

## India

There were 207 articles in the sample of publications concerning India. These had a total of 706 author-defined keywords. The threshold of occurrence was set to 5, and the remaining 15 keywords are included in the co-occurrence map presented in Figure 4. The most frequently occurring keywords next to *curriculum* ( $n=73$ ) and *India* ( $n=24$ ) are *medical education* ( $n=14$ ), *curriculum development* ( $n=10$ ) and *education* ( $n=8$ ). Note again that occurrences of *curriculum* would be much higher if multiple-word keywords containing ‘curriculum’ would be counted together. The fact that medical education is one of the most prominent topics is not surprising given that four of the Top 5 journals for India are from the medical field (see Table 3). Medical education in India is a highly important topic as the availability of health workers is much below recommendations by the World Health Organisation (see Sabde et al., 2020). Interest might also be high as the National Medical Commission Bill was introduced in 2019 in order to improve the medical education system. Keywords in the map form four clusters. The medical cluster (in green) contains keywords such as *medical curriculum*, *medical students* and *knowledge*. Note that *knowledge* is linked to keywords across the map, such as *teaching* and *curriculum development*. The largest cluster (in red) shows again that higher education seems to be heavily featured in publications on curriculum.

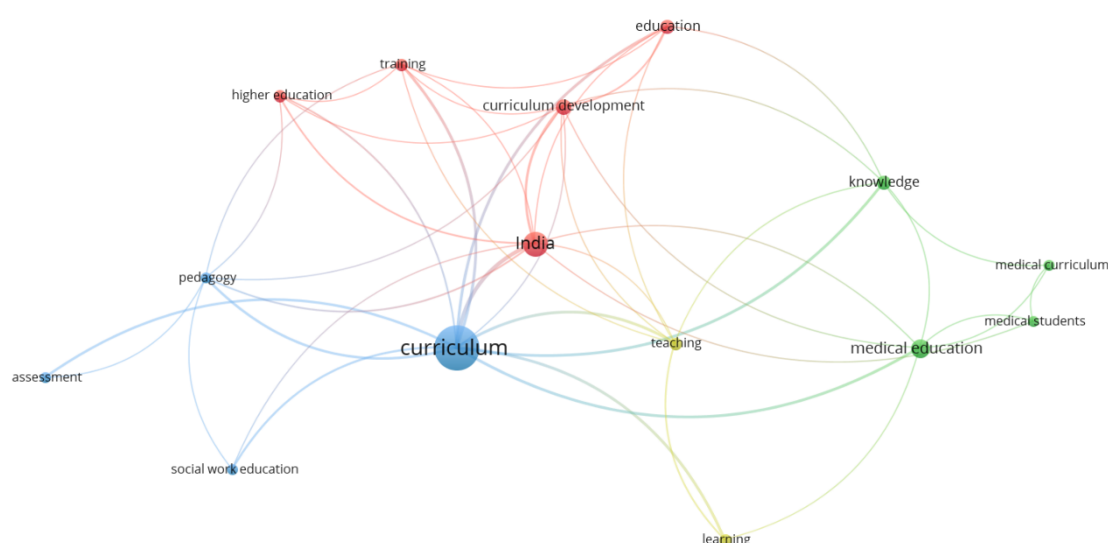


Figure 4: Keyword co-occurrence map of curriculum publications pertaining to India between 2017—2021.

### Ethiopia, Kenya, Ghana and Estonia

The keyword analyses for curriculum publications concerning Ethiopia, Kenya, Ghana and Estonia are presented together given the scarcity of publications and, thus, keywords. The small number of publications and reoccurring keywords make it difficult, if not impossible, to identify important patterns or topics. There are only 22 journal articles in the sample for Ethiopia, and within these only 97 keywords appeared. Accordingly, the keyword co-occurrence map presented in Figure 5 looks very sparse. The threshold for the map has been set to merely 2, which was met by seven keywords. As shown in the map, these are *curriculum* (n=9), *Ethiopia* (n=6), *Africa* (n=3), and then *competency*, *education*, *medical education*, and *training*, which all occurred in two publications. All other keywords within publications appeared only once.

Similarly, the sample for Kenya included only 37 journal articles, which featured 153 keywords. Of these keywords, only three appeared in five or more publications, which is why I set the threshold to 2. The 10 keywords that met the threshold are depicted in Figure 6. The most frequent keywords were *curriculum* (n=14), *Kenya* (n=7) and *education* (n=5). All other keywords included in the map appeared in two publications alone. *Curriculum*, *Kenya*, and *education* are very general areas that do not indicate specific topics of current debate, and keywords that occurred only twice in publications over the past five years hardly indicate matters of special relevance.

There were 24 curriculum publications concerning Ghana, which included 97 keywords. The threshold for the co-occurrence map was set to 2, and the remaining six keywords are depicted in Figure 7. All keywords in the map except for *Ghana* (n=9) and *curriculum* (n=6) appeared only twice.

The curriculum publication landscape for Estonia looks even scarcer. There were a mere 10 publications within the sample, which featured only 47 keywords. The only keywords that

occurred more than once were *curriculum* (n=3), *Estonia* (n=2) and *curriculum development* (n=2). None of these keywords co-occurred within the same publication. Hence, no co-occurrence map is presented here.

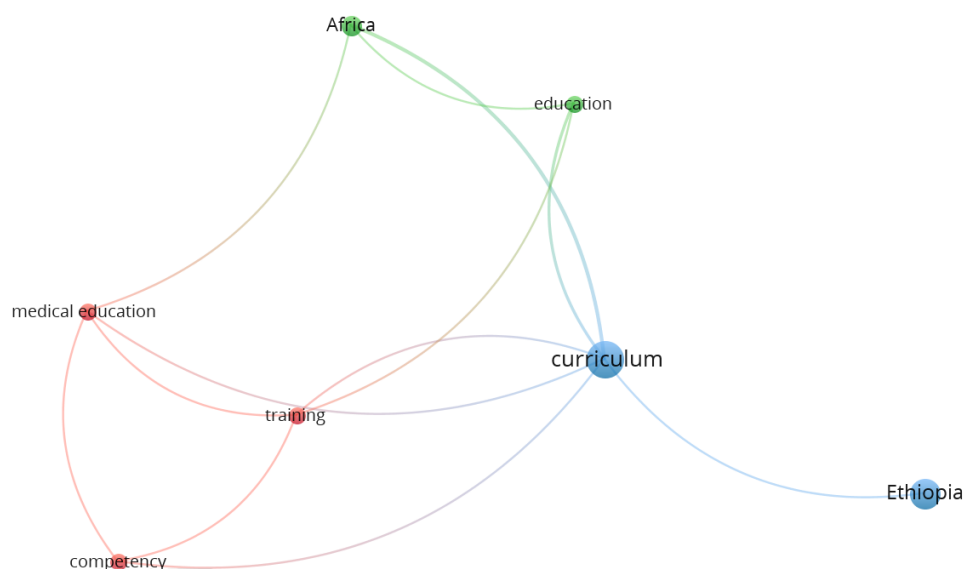


Figure 5: Keyword co-occurrence map of curriculum publications pertaining to Ethiopia between 2017–2021.



Figure 6: Keyword co-occurrence map of curriculum publications pertaining to Kenya between 2017–2021.

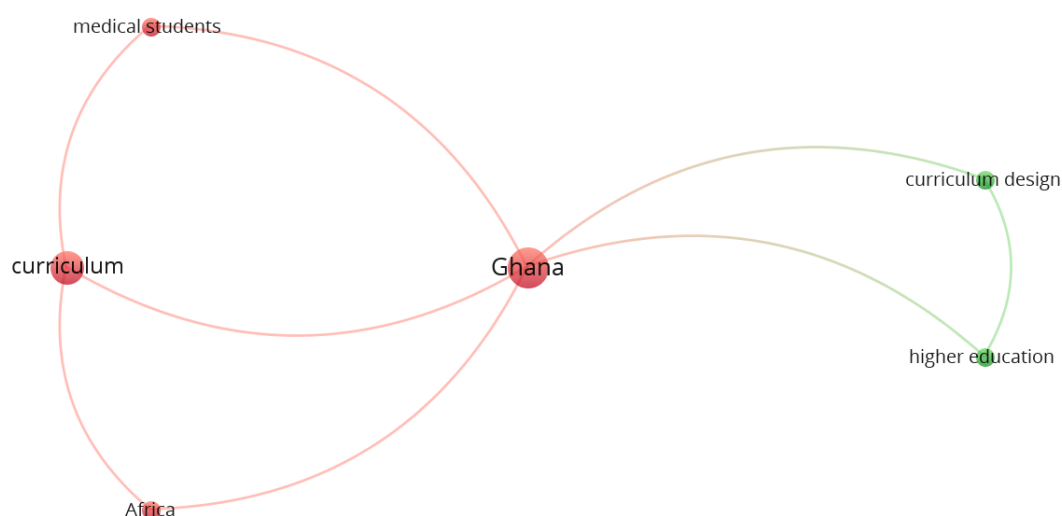


Figure 7: Keyword co-occurrence map of curriculum publications pertaining to Ghana between 2017—2021.

## Limitations

Bibliometric analysis aims to provide an overview of a given research field rather than deep insights, and the analyses using VOSviewer enabled such an overview. Yet, there are also important limitations that need to be kept in mind. The current analysis showed that relying solely on the tool without examining the publications more closely can lead to misleading conclusions. Specifically, the fact that VOSviewer only counts keywords together which are identical can lead to the underrepresentation of important areas. In addition, the output of course crucially depends on the input. The selected database determines which works are included. Research that is not published in English might be excluded as well as research published in outlets other than peer-reviewed journals, including books and dissertations. It can thus not necessarily be claimed that all relevant works are captured.

## Conclusion

This report provided a bird's-eye view of curriculum publications concerning seven countries. It found that there is much more research pertaining to Australia, South Africa and India compared to the other countries overall as well as across time. There was an increase of publications over time for these three countries while the number of publications concerning Ethiopia, Ghana, Kenya and Estonia remained low. Based on the country of author-affiliation, most publications concerning a given country have also been conducted within that country, which is why differences in research resources may explain variations in publication rates. In addition, the typical language of publication is likely to affect which journal articles have been included in the database, with those published in a language other than English being excluded. Hence, publications in countries where English is a national

language presumably had a higher chance of being included. To gain a more comprehensive view over curriculum publications, other sources than Scopus may thus need to be considered. The number of journal titles within which the curriculum publications appeared is vast, and no particular journal stood out as the most important one. This report also found that publications related to higher education and the medical field are especially frequent. In addition, topics such as decolonisation and indigenusness seem very relevant.

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***Effectiveness of Digital Game-Based Learning on Academic Achievement in  
an English Grammar Lesson Among Chinese Secondary School Students***

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Official Conference Proceedings

**Abstract**

Previous studies have proven that the widespread implementation of digital game-based learning (DGBL) in educational practice can be potentially beneficial. To date, however, far too scant attention has been paid to its efficacy in English grammar learning in China. Therefore, the principal objective of this study was to examine the effectiveness of DGBL on Chinese secondary school students' academic performance in English Grammar study. This research adopted a quasi-experimental design, and the samples consisted of 98 students from two first-grade classes at a public high school in Guangzhou. They were divided into an experimental group (n=49) and a control group (n=49), which received the DGBL and non-DGBL methods, respectively. As a formative assessment approach in the lecture, this research utilized Wordwall.net, a unique digital game-based online assessment instrument. The quantitative data was collected and compared in both groups. The results revealed significant statistical differences between the two groups, suggesting that DGBL was an efficacious tool for enhancing Chinese high school students' academic performance in grammar learning. The presented findings can contribute to the further development of DGBL and provide instructional implications for grammar learning.

**Keywords:** Digital Game-Based Learning, Academic Achievement, Grammar, Secondary School Students

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## Introduction

As the pace of globalization has accelerated and English become an increasingly essential lingua franca these days, English competence has evolved as a pivot for learners worldwide. Many non-English-speaking nations emphasize English as the most essential foreign language, as it facilitates people to interact with one another across national boundaries (Schumitt, 2014), further foregrounding the importance of research pertaining to second and foreign language teaching (Hinkel, 2016). During these processes, grammar instruction is the most controversial part of the history of foreign language teaching, which mainly focuses on whether it should be taught and how to impart it (Liu et al., 2018). Nonetheless, English grammar remains one of the rudimentary skills in the curriculum (Liu et al., 2018; Lin et al., 2019), playing a crucial role in the development of language and social contextual skills (Halliday, 1975), and showcasing a major guideline for effective English learning (Cam & Tran, 2017).

There is a consensus that studying grammar is one of the demanding tasks for learners, and many students have shown negative attitudes towards it, such as demotivation, disinterest, and lack of enthusiasm (Eltahir et al., 2021; Lin et al., 2019), which further hinders the learning process and outcomes. Similar situations are shared by Chinese students above (Liu et al., 2018), which can be attributed to unsatisfactory learning needs of students, such as conventional learning and teaching methods and lack of modern technology usage in language learning (Eltahir et al., 2021; Moylan et al., 2015). Students usually learn English grammar through the grammar-translation approach or through textbooks by filling out sentences with grammatical forms correctly according to the teacher-centered method (Liu et al., 2018; Lin et al., 2019). In China, the promulgation of the standards of the General High School English Curriculum (Chinese Ministry of Education, 2017) emphasized the importance of grammar learning and teaching, urging teachers to guide students to adopt and design different creative types of grammar education activities, integrating diverse teaching activities to develop students' awareness and ability of English grammar through exercises and activities in and out of the classroom under the information technology environment. For this reason, it is practical and pivotal for most English teachers and researchers to explore technology-assisted language learning tools and methods to inspire students to learn grammar.

The emergence of new technologies has resulted in the development of a variety of educational frameworks and instruments that enhance the efficiency pertaining to the process of language study. Digital games, for example, have been adopted and recognized with regard to learning practice and language instruction, which might have remarkable effects on students' learning performance when applied in classrooms since such games can enhance students' interests and motivation for learning (Dickey, 2005; Eltahir et al., 2021; Hwang et al., 2013). Despite that the advantages were found in most language learning domains, there is a paucity of research conducted at the secondary level, especially in estimating students' grammatical and academic achievement in China. Therefore, this study aimed to examine the influence of DGBL on students' academic achievement in English grammar classrooms in the secondary education.

## Literature Review

Digital games are employed in educational contexts and have been employed as a form of new media for learning in various subject areas, including history, mathematics, engineering,

and English (Eltahir et al., 2020). Among such areas, studies have found that digital games are increasingly being used to support language learning, disclosing its great potential for providing students with various benefits compared with conventional means. Yen, Hou, & Chang (2015) stated that DGBL provides students with various practicing opportunities and reduces their affective barriers, such as anxiety, which is a conducive approach to increasing students' participation and learning motivation. For example, Campillo-Ferrer et al. (2020) adopted a quasi-experimental study on 101 undergraduate students to investigate the efficacy of Kahoot! as DGBL to improve students' active participation and motivation, showing positive outcomes and also stimulating the learning environment. Eltahir et al. (2021) conducted a quasi-experimental study to evaluate the impact of DGBL at an Arabic grammar lesson in a local university, which affirmed its effect highly improves students' engagement and motivation. Alawadhi and Abu-Ayyash (2021) employed a mixed-method study in Emirati to assess the effect of DGBL from 112 undergraduate students' perspectives in English classes, disclosing students' high participation and enhancing the enjoyable learning experience. These studies show that educators adopted DGBL to facilitate students studying via generating an enjoyable and entertaining study atmosphere, which makes the learning process more exciting and compelling.

Additionally, researchers have claimed that DGBL can help learners stay motivated by providing different challenges and gradually enhancing their learning outcomes (Chen et al., 2020). Yeh et al. (2017) conducted a quantitative study that employed the DGBL approach to show two groups of university students' English learning performance, demonstrating its positive outcome of improving their academic achievement. Lin et al. (2020) used DGBL to examine its effect on first-year college students' grammar learning outcomes in Taiwan, showing that the treatment significantly decreased students' errors in the empirical group. In China, Deng et al. (2020) conducted a case study on primary school students to show the effect of DGBL in Shanghai, showing the positive effect of increasing students' mathematical scores. Above all, literature has shown that digital games can positively impact students' learning outcomes.

Due to the advantages and increasing popularity and the ubiquitous presence of digital games, research has also revealed that learning based on digital games (DGBL) has shown positivity (Dixon & Christison, 2021; Reinhardt, 2019). The studies described that DGBL is a creative and productive instructional approach within the teaching and learning area, thus facilitating students to enhance their language learning performance, improving cooperation and motivating their study as well (Belkhouche et al., 2014; Mei et al., 2018; Sahrir & Yusri, 2012). Despite the aforementioned benefits of DGBL, there is a dearth of studies conducted to explore the effectiveness of using DGBL to increase students' grammar learning outcomes at the secondary level, especially in Chinese high school. Therefore, this study set out to investigate the following questions:

RQ1: What is the effect of using DGBL on Chinese secondary school students' grammar learning?

RQ2: Are there significant differences between students using DGBL and those using conventional methods?

## Methodology

The quasi-experimental study was designed according to its objective of this study. Figure 1 shows the design procedures in detail. To ensure the equivalence of the participants in this

study presented, a t-test was employed to make a comparison after both of these groups were administered a pretest before the experiment, which consisted of the revision topics of an English grammar test with 15 multiple-choice questions.

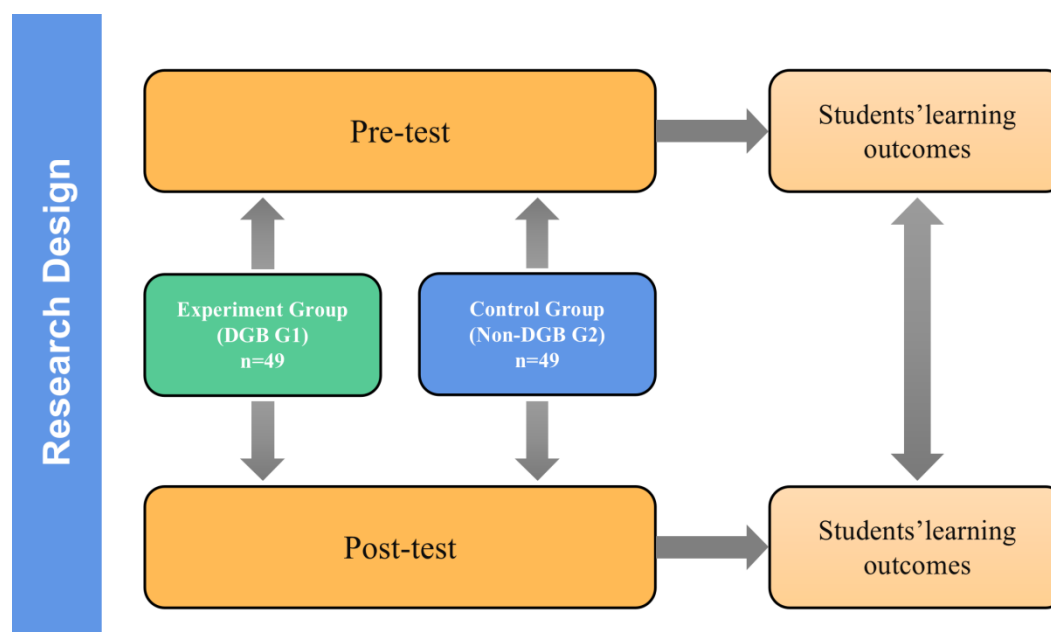


Figure 1: Design of the study

## Participants

The participants of this study consisted of 98 first-year students of two classes studying in a public high school in Guangzhou during the second semester of the 2020/2021 academic year. As the researcher was also the English instructor for these sessions, convenience sampling, a non-probability sample methodology (Dornyei, 2007), was used to recruit the participants. In this study, class A (n=49) and class B (n=49) were selected as an experiment group adopting the DGBL method, and the control group employed the traditional one, respectively, where all students had compulsory English grammar lessons per week.

## Procedure

Following the presentation of the same grammar learning content, the post-test was then applied to both groups during the class, in which the form and content of the formative assessment test were identical to the pre-test, emphasizing the chosen topics from the English grammar lessons. This exam consisted of fifteen multiple-choice questions, which were assigned by professionals in the English teaching department, and assessed the knowledge of the themes covered in the lectures. The control group completed the exam using a standard paper-based format, whereas the experimental group utilized the DGSRS Wordwall.net. The purpose of this procedure was to explore the difference between the experimental group and the control group in the formative evaluation test, from which quantitative data were collected and transferred into analysis with the help of the IBM SPSS Statistics Version 26 software platform, performing the descriptive analysis further, independent sample t-test and paired-samples t-test. Next, we illustrated the details of two formats of formative evaluation tests, respectively.

## **Paper test**

A single score was given for each question for the correct answer and zeroed for the incorrect answer. This resulted in the highest score on the test being 15, while the lowest score was 0. While giving the class lectures, all control group participants were evenly distributed the paper test during this study with a duration of 10 min. Students used pens to select answers from four options in the paper, and the researchers closely monitored the course to make sure no one had a chance to copy another student's answer. After the class, all the participants' papers were collected at the end of the class, and then the paper was given to the students with grades and feedback on their performance in the following lecture.

## **Wordwall.net: Digital Game-based Student Response System (DGSRS)**

The questions appeared on a big display screen showing the title of the TV QUIZ SHOW, followed by fifteen multiple-choice questions. Each question entailed a picture related to the topic has only one correct answer, and students tried to answer each question as quickly as possible to obtain more points. Additionally, there are two bonus rounds in the game provided to the participants. However, the researcher excluded the bonus point due to the consideration of the final score of equivalence of the two groups.

As the formative assessment, Wordwall.net allowed the researcher and teacher to understand the students' comprehension of the selected topics quickly. Students received their scores based on their performance on their tablets personally, such as the total number of points, the ranking on the leader board, and the answers. On accomplishing the Wordwall.net section, the leader board then appeared, showing the Top 10 winners of the game and correlated points on the whiteboard. In the test procedure, Wordwall.net employed a creative graphical user interface, together with related pictures of the questions, music, and sounds, which created an amusing and competitive atmosphere, acting similar to a real television quiz show (see Figure 2). Eventually, students' scores on Wordwall.net were allowed to export to the Excel format.

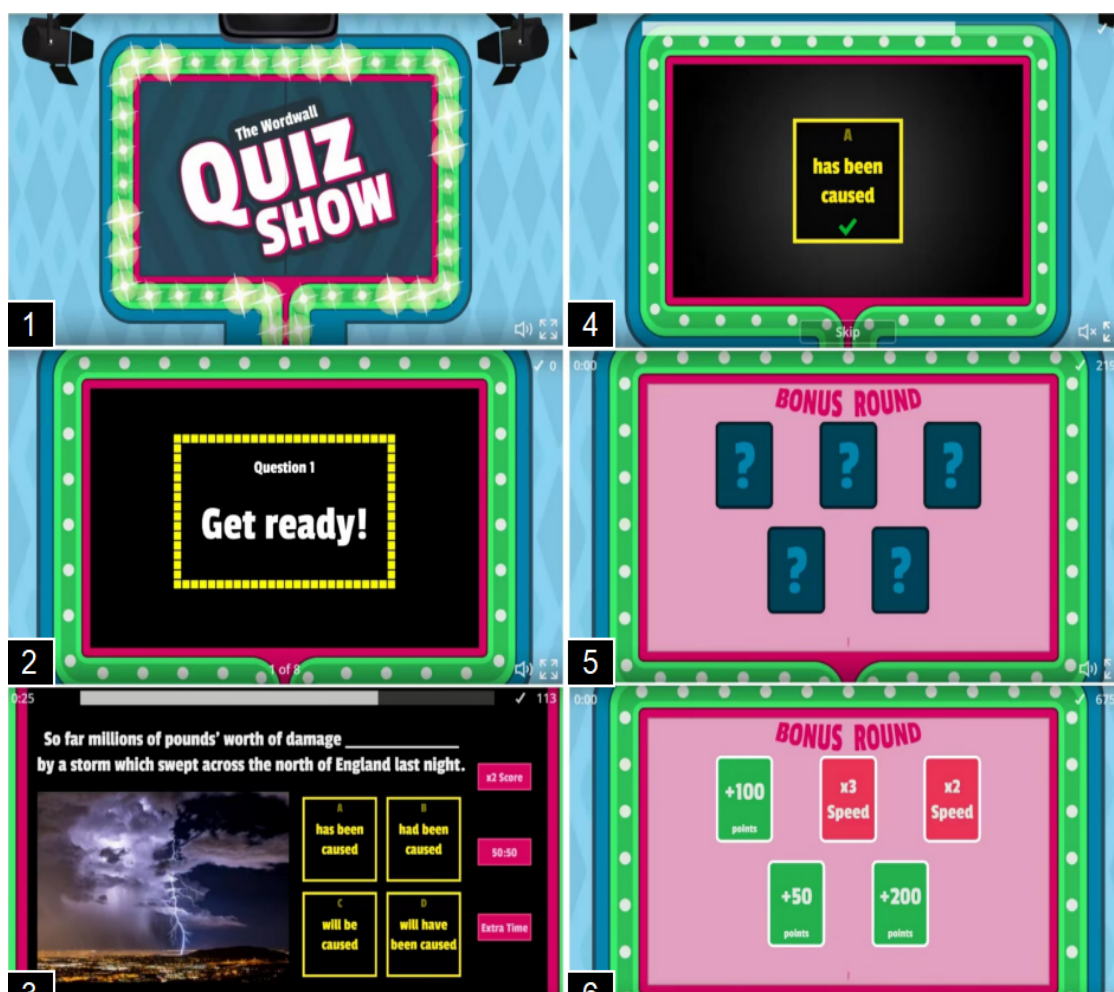


Figure 2: Screenshot of Wordwall.net

Additionally, several factors have been considered, such as topics, period of test and instruction, and question similarity. In other words, the groups had the same instructional period and grammatical topics and answered a similar formative assessment test consisting of fifteen multiple-choice questions in ten minutes.

## Results

Considering that the extracted  $p$  (0.97) is more significant than 0.05, the test is insignificant at the 0.05 scale, which indicates that there is no significant difference between the experimental and control groups. The results showed that the experimental and the control groups were equivalent prior to the experiment.

The paired sample statistics (see table 1) shows the mean and standard deviation before and after the intervention in the experimental group. It can be observed that the average or mean evaluation of the experimental group before the intervention of DGBL is 8.61, while after the intervention, the mean evaluation is 10.98.



Table 1: Paired Samples Statistics

		Mean	N	SD	Std. Error Mean
Pair 1	EG pretest	8.61	49	2.65	0.38
	EG posttest	10.98	49	2.04	0.29

The actual result of the t-test is provided in the paired samples test table below (see Table 2). From the sig. (2-tailed) column, it can be observed that the p-value is 0.00, and the paired sample T-test revealed that there was a statistically significant increase in effectiveness or evaluation of the students in the experimental group from  $8.61 \pm 2.65$  before the intervention to  $10.98 \pm 2.04$  after the DGBL intervention (mean difference = -2.37),  $t(48) = -6.84$ ,  $p < 0.05$ .

Table 2: Paired Samples T-test

		Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig.
					Lower	Upper			
Pair 1	EG pretest-posttest	-2.37	2.42	0.35	-3.06	-1.67	-6.84	48	0.00

Additionally, a t-test was used for the independent samples, as presented in Tables 3 and 4. It can be observed from the group statistics (see Table 3) that the mean or average post-test score for the experimental group is 10.98, while that of the control group is 9.69. The actual result of the independent samples test is provided in table 4 below. It can be observed that the test is not significant,  $p = 0.69$  ( $p > 0.05$ ). Hence Laveane's test for equality of variances is met. Additionally, it can be observed that the p-value is 0.002 ( $p < 0.05$ ), which implies that the independent samples t-test is statistically significant.

Table 3: Independent Samples Statistics

	Group	N	Mean	SD	Std. Error Mean
Post-test	EG	49	10.98	2.04	0.29
	CG	49	9.69	1.87	0.27

Table 4: Independent Samples T-test

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	t	df	Sig.	MD	SD	95% Confidence Interval of the Difference	
									Lower	Upper
Post-test	Equal variances assumed	0.17	0.69	3.25	96.00	0.00	1.29	0.40	0.50	2.07
	Equal variances not assumed			3.25	95.34	0.00	1.29	0.40	0.50	2.07

Therefore, the independent sample t-test conducted revealed that the posttest score of the experimental group (10.98) is statistically significantly higher than that of the control group (9.69),  $t(96) = 3.25$ ,  $p < 0.05$ .

## Conclusion

The results of this study revealed a substantial difference between the experimental group's learners' performance before and after DGBL intervention, indicating that DGBL was productive. Regarding the post-test findings, the independent t-test demonstrates a statistically significant difference between the two groups of students' grasp of the English grammatical themes addressed in the lectures. In other words, the students who were taught with Wordwall.net, as appeared in Table 4, namely the experimental group (DGBL group), were higher than those who were taught through the control group, namely the non-DGBL group, which suggests that the DGBL group is more effective than the control group, namely the traditional learning. Concerning students' comprehension of issues discussed in language grammar in the classroom, it is noted that the use of Wordwall.net had a significant impact on students' learning outcomes of targeted content. The results of this study are consistent with previous research confirming that DGBL can boost student achievement.

In short, the purpose of the study was to investigate the effectiveness of DGBL on Chinese secondary school students' academic achievement in an English Grammar Lesson among Chinese Secondary School Students. The study's findings assured that applying DGBL to grammar teaching and learning in secondary level students positively influenced students' grammar learning. Additionally, it has been proven that DGBL is more effective than the conventional learning methods when students learn grammar in Chinese secondary school students. Moreover, this study also proves that Wordwall.net could be used as one of the digital game-based learning tools in the process of grammar learning. Other than that, the findings fill the aforementioned research gap and align with previous literature on the positive impact of DGBL in language learning. As for the implications, it is suggested that teachers may apply DGBL in their instructional procedures and possibly adopt it in their assessments, such as formative assessments. Despite the key findings, it is noteworthy that this study's limitations needed to be addressed. First, the sample size of the study is relatively small. Second, this study is mainly focused on first-graders within a short period in China,

which may influence the effect of DGBL. Therefore, future studies may conduct more large-scale and longitudinal studies on the impact of DGBL.

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***Establishing a Writing Practice Remotely: A WhatsApp Course for Academics***

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**Abstract**

In many universities there are numerous writing courses, workshops, resources and writing centres for academics. Some of these were disrupted by the Covid pandemic. A positive outcome has been moving beyond Emergency Remote Teaching to innovative pedagogical alternatives that continue to be effective as lecturers and academic developers reenvision teaching interventions past the pandemic era. A WhatsApp Writing intervention has provided a new way for research writers to make progress on their writing. This study describes and reports on a 10-day WhatsApp writing course that is designed to connect group members, increase accountability, address obstacles to writing and develop the identity of the writer. The format addresses issues of access and zoom fatigue. The theoretical basis of the design draws from mindfulness, coaching and research into academic writing. The course was run for between 10 and 40 participants in 16 separate courses. Participants include supervisors, postgraduate students, as well as creative writers across South Africa and internationally. I analyse and share some observations from participants' contributions on what makes writing difficult, their writing blocks, as well as their perceptions (and changing perceptions) of themselves as writers. Personal perspectives from writers show up three main common concerns of lack of confidence, distractions, and isolation. The posts also highlight the individual sense writers have of their identity. The course format could serve as a model for similar curricula design interventions.

Keywords: Academic Writing, Writer Identity, Online Learning, WhatsApp Course

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## Introduction

Much has been written recently of moves to on-line learning, student responses to remote teaching and also the crisis of well-being among academics especially in the time of Covid lockdowns. The aims and design of the WhatsApp writing course described here are in response not only to the need for online writing support, but also take into account academics' increased isolation and frequently-reported distress. The course design, while aiming for optimal accessibility, deliberately focusses on the personal perspectives of the writer, creativity, fun, as well as daily structure and accountability to the group. Activities are designed to explore writer identity; individual writing journeys; overcoming writer's block; finding one's voice; and forming a Community of Practice. As Castle and Keane (2017) pointed out, before the event of Covid: academics need more than policy mandates to flourish as writers. This remains true and should not be lost sight of in the pressures to publish and produce outputs. Lee and Boud (2003) argue for the importance of identity work in developing writing. In addition, the complementary aspect of social engagement, which Dwyer, Lewis, McDonald and Burns (2012) emphasise as necessary for authentic professional development, is somewhat provided for by the immediacy and informality of social mediate messaging.

In this paper I explore a different aspect of the 'personal development discourse' put forward by Çimen where she argues, citing Marsen (2007) that self-development books may be considered as technologies of the self while they actually serve neoliberal managerialism. Little less acerbically, Liang (2015) concludes in her thesis that the self-help genre, aimed at improving a person's life, has a strongly individualistic orientation." Liang, 2015). Such a discourse does not necessarily fit alongside Communities of Practice, collegiality and collaboration which is the aim of the course discussed here.

This paper centres on the inquiry: How may academics be supported, especially remotely, to develop their writing, and not simply find fixes to complete a degree or complete a product?

I start by describing briefly the course rationale and theoretical underpinnings; and then present a course outline and examples of participants' responses to daily tasks. I then conclude with an argument for the inclusion of mindfulness, creativity and collegiality in a digital space, where writers develop self-reflection and a sense of agency.

## Focusing on the writer or the writing?

At some universities a template or directive Writing Frames are provided for students undertaking research for a postgraduate degree. Students frequently ask: 'How long must the Introduction be?' 'How many words must I have in the conclusion?' 'How do I structure my findings?' There are a plethora of websites, self-help books, 'How to complete a Doctorate' guides, as well as innumerable short courses on research and writing. See for example Badenhorst (2007; 2008; 2010); Murray, (2013); Murray and Moore (2006); Silvia (2007). There is a continuum along the axis of 'How to' writing assistance and 'Writer identity development'. Technical advice on writing, while helpful, is not sufficient for establishing productive writing habits among academics, as Moore (2003) and Murray (2013).

In the same vein Thomson and Kamler (2013), while providing numerous writing guides argue that "we are never just writing the article, we are also simultaneously writing our self." It is clear that this is a complex process that is not without obstacles.



Grant (2000) and Grant & Knowles (2000) advocate increasing participants' As Chihota & Thesen, (2014) claim that "writing one's way into being a postgraduate involves many small acts of trying on that identity and slowly building it into a composite experience." pleasure in their writing and Castle and Keane (2016b:268) show how confidence in writing increases academics motivation to write. We agree with these authors. Writing, and exposing one's writing to others for scrutiny and critique, can make writers feel vulnerable and exposed (Murray & Moore 2006; Murray 2013) thus writing more regularly and with others in non-threatening spaces is valuable. (Castle & Keane, 2016b).

In relation to academics' research and writing, Backhouse (2011) identified three doctoral discourses, each with a distinct purpose: the 'scholarly discourse', the 'labour market discourse' and the 'on-going personal development discourse'. This third discourse she defines as "somewhere between revealing an independent scholar and training a skilled human resource ... that of developing a critical intellectual" (Backhouse, 2011: 33).

As many of the WhatsApp course participants are pursuing doctoral research or writing for publication, it is clear that gaining and communicating deeper and more nuanced understandings is essential, as is developing a unique identity as a writer. The 'personal development discourse' extends beyond the 'How to' genre to the holistic development of the writer and the writer-in-community.

In summary, I am not dismissing the usefulness of any of these support structures or writing frames but querying whether reliance on more step-by-step templates promotes the development of a writer identity, and whether they provide sufficient encouragement and challenge to provoke criticality and creativity. Some balance is needed for writers to move from the position of experiencing academic writing as "...mysterious, daunting and unsupported' (Moore, Murphy and Murray 2010, 21), and discovering for oneself authentic new knowledge and the ability to push the boundaries of disciplines and genres. Many academics struggle with the pressures to publish articles without having any mentoring or induction into the process (Kapp, Albertyn & Frick, 2011). Kamler and Thomson (2008) having analysed some characteristics of this self-help genre, including the ways it produces an expert–novice relationship with readers. It also reduces dissertation writing to a series of linear steps, enumerates rules, and asserts a need for compliance to a set standard. These authors argue for a more complex view of doctoral writing both as text work/identity work and as a discursive social practice. In this lies the challenge for a short online course. WhatsApp, however, is ideal for group interaction, informality and immediacy. WhatsApp is also less likely to rely on transmission pedagogies that normalize the power imbalances. With this in mind the theoretical and practical approaches in the course design include: mindfulness, coaching, experiential learning, and developing a community of practice.

### **Theoretical underpinnings**

This WhatsApp course described here is underpinned by concepts of experiential learning and on-line learning, but importantly, in its design, draws on practices of mindfulness and co-active coaching. Dirkx (1997; 2001) proposes that meaningful learning is grounded not only in rational, critical, and cognitive processes but in a person's emotional, imaginative connection with the self and the social world. Both mindfulness and coaching offer useful perspectives to encompass these human and social aspects of writing.

## Mindfulness

Mindfulness here means being present with our writing; thoughts, feelings, and developing focus while writing. Mindfulness, as described by Glomb, *et al* (2011: p, 118) is “paying attention to what is happening in the moment...” For many of us distraction from the task in hand, the writing or reading, is an enormous challenge. whole range of input and competing demands for our attention, including mental clutter, so that focusing on the one intended task at hand – writing – may be very difficult. Beauchemin, Hutchins, and Patterson, (2008) have shown how mindfulness contributes to intellectual achievement. Writing sessions in this course therefore deliberately start with an intention to set aside multitasking. Developing clarity and voice require being present and focused on the writing project for some length of time. Another aspect of mindfulness is its facilitation of insights, productivity as well as physical stress reduction (see National Health Services in the UK, and the Oxford Mindfulness Centre. Most of the voice notes for each day begin with a short mindfulness exercise. Mindful pedagogy is based on the premise of a student showing up 100%. Mindfulness also facilitates access to multiple meta-perspectives and improved cognitive processing (Langer & Moldoveanu, 2000).

## Coaching pedagogy

Some of the strategies and tools from coaching contribute in this course by requiring students to clarify their goals, to self-reflect on their personal development and to be accountable. At the start of the Course participants are asked to share their writing goal with the group and to periodically check-in on their progress, feelings and reflections. The coaching tool of identifying one's 'inner gremlin', sharing what these inner critics say help writers realise that they are not the only ones suffering from insecurities and writer's block. Such exchanges through WhatsApp normalize the writer's struggle and diminish feelings of isolation. Coaching, opens up paths for creativity which is brought in through drawing activities, free-writes, mind-maps and the use of metaphor. Some of these tasks provoke a sense of fun which assists one to gain perspective and relax. Easy creative activities at the start the of day are often the beginning of a new mental space where practicing letting go of thoughts about the past and future helps writers develop focus and connect to others attentively. Through fostering an ability to be present and to play creatively we have an opportunity to see things anew. (Keane, 2017:143).

## Course design

Course design draws from both the facilitator's experience but also the literature. According to Murray and Moore (2006, 24–27) and Murray (2013) drawing on international research and theory suggest the following: Interactivity and dialogue with others (that is, talking with others about research through personal or virtual interactions); Knowledge creation and extension; Achievement, output and approval; Engagement and getting into the 'flow' of writing. The benefits of group work are confirmed by Silvia (2007) who claims that they can sustain individuals' accountability and help writers meet deadlines.

The WhatsApp daily messages include voice notes, short texts on the daily writing topic and two to four tasks for the writer to complete. At the end of each day the writer simply posts: 'Day Complete' with their name. About five of the days require additional posts from participants such as topic researched, brief comments, drawings or check-ins. Many of the activities are creative. Such activities not only assist with the writing process but change the

way we relate to our work and to each other. Developing writing capacity can foster collegiality, mutuality and sense of community (Castle & Keane, 2016) and perhaps surprisingly this was evident for a short course through the informal social medium of WhatsApp.

## Conclusions

Discoveries from bring a facilitator on the course, and from course evaluations and feedback are, firstly, that groups are so very different: some groups did not finish; another has continued on their own for 2 ½ years. This is evident even if groups are from the same level and same university.

Writing in English, using academic language, appears not to be a great problem. This in spite of the majority of participants having English as a second or third additional language.

Initial feelings of isolation, fear, procrastination, self-doubt turn out to be common obstacles.

Creativity, sharing, humor, routine, commitment to the group are helpful elements for productive and enjoyable writing.

Admitting to difficulties and experimenting with play seems easier for more experienced writers.

The asynchronous course design allows all to participate; flexibility and encouragement are important. Participants end up supporting course design through their input.

Goal setting was useful but avoiding a template-following strategy freed up writers to discover their own voice and creativity.

A typical response came in a free-write on 'I am the kind of writer who...'. A participant wrote:

*"Now I understand myself better as a writer ...I am the kind of writer who likes to procrastinate...! My writing takes many paths when I have an idea ...thanks to these tasks, I feel as though my writing can be more structured and I can focus on one path at a time."*

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## ***Enabling Factors That Lead Educational Middle Leaders to an Effective Professional Performance***

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### **Abstract**

Effective school leadership is made of senior and middle leaders who work effectively and collaboratively. More than ever, in the 21<sup>st</sup> century, there has been recognition that schools need knowledgeable, skilled, proactive and committed leaders, along with great teachers, to ensure outstanding education at all levels of schooling. The scope of this paper lies within the sphere of the work of middle leaders, who can make a great impact on student learning outcomes for having a direct influence on teachers and classroom teaching. It aims at sharing findings obtained through an academic qualitative case study carried out in 2021, by the same researcher, on the professional performance of educational middle leaders, applied to the context of the lower elementary school division of a private Brazilian school. The master's dissertation research questions included one focused on discovering the enabling factors that lead middle leaders towards a professional performance of excellence. Through an electronic questionnaire and individual face-to-face interviews, whilst being supported by a solid body of research underlying the study, it was possible to find out evidence that four enabling factors are essentially important for middle leaders to play their roles with efficacy, which are: an 'inner drive', a 'specific knowledge and skills base', 'in-service professional development (PD) programme', and effective 'support by their senior leaders'. This paper aims at outlining the main aspects concerning the empiric research undertaken, and mainly at placing an emphasis on these enabling factors, approached in depth in the dissertation report.

**Keywords:** Educational Middle Leadership, Effective Professional Performance of School Middle Leaders, Enabling Factors

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## Introduction

In the first decades of the 21<sup>st</sup> century, effective school leadership has increasingly become an education policy priority around the world, along with high-standard teaching, as countries have made efforts to adapt their educational systems to the needs of contemporary society. Bush and Middlewood (2005) remark that the longstanding appreciation of the vital role of teachers is belatedly being matched by an understanding that effective school leaders are also essential if schools and colleges are to thrive. Hence, schools need committed, skilled and effective educational leaders (Bush, 2009, p. 375), as it is widely acknowledged that “*great teaching and great school leadership are the foundations of a world-class education system*” (DfE, 2020, p. 5) from preschool to university levels.

It is also true that, in many countries, including in Brazil, where this study has been carried out, school leaders hold leadership positions for many years, relying on an initial academic background and a work experience in the area of teaching. However, schools are complex organisations, and the growing complexity of problems faced by leaders demands from these professionals a set of knowledge and skills which differ from that of the classroom teachers (Irvine and Brundrett, 2016, p. 87). Studies such as one undertaken by Pont et al. (2008) for the Organization for Economic Co-operation and Development (OECD) have concluded that a teaching background does not in itself provide educators with the necessary repertoire to perform the roles of school leadership with efficacy.

Additionally, schoolteachers often do not receive an induction training when they assume a middle leadership position, nor can they count on a professional development (PD) programme for the leadership team in-service, through which their development needs can be identified and met.

The OECD Teaching and Learning International Survey (TALIS) released in 2019 shows that the landscape of teaching and school leadership has changed since 2008, in terms of the profiles of these professionals, and on how they are expected to develop themselves (OECD, 2019a).

It is important to underline that school leadership is made of senior leaders and middle leaders, and that this paper is centred on the professional performance of middle leaders in schools, which is an under-researched topic worldwide (De Nobile, 2018).

This paper aims to present one of the topics approached in a master’s dissertation research, carried out by the same researcher in 2021, whose purposes included uncovering the enabling factors that are essential to ensure an effective professional performance by educational middle leaders.

The interest for the dissertation research was driven by a conviction that effective middle leaders are key components for schools to succeed (Bush, 2008), in a new era characterised by “*dispersed leadership and school change focused on the personalisation of learning and introduction of 21<sup>st</sup> century curriculum and pedagogy*” (Gurr and Drysdale, 2013, p.55), although this effectiveness is not often achieved, as these professionals face barriers preventing them from realising their full potential. Such barriers include not having a formal leadership position, nor their roles well-defined, and not being properly supported at work. By disseminating part of the academic study carried out, through this paper, the researcher



intends to draw attention to a current demand that is the advancement of the body of research on middle leadership in schools, despite of the increasing interest in it.

The scope of this study is the professional performance of middle leaders applied to the context of the lower elementary school division of a private mainstream school. The research question underpinning it is as follows: *What are the enabling factors that lead middle leaders to an effective professional performance?*

## Literature Review

The history of research on school leadership is long and insightful, but most of this is centred on the work of school principals, rather than middle leaders, as remarked by researchers like De Nobile (2018) and Grootenboer et al. (2015). However, there is a growing interest in educational middle leadership by scholars like Gurr (2021), De Nobile (2018), Gurr and Drysdale (2013), and Cranston (2009), among others, resulting from the fact of that competent middle leaders are regarded as key elements for effective schools (Irvine and Brundrett, 2016).

Research on school leadership and management undertaken by authors like Harris and Jones (2016), Spillane et al. (2011) and Leithwood et al. (2007), throughout the past twenty years, has demonstrated that the enactment of a number of roles performed by school principals relies on the engagement of other leaders. Therefore, the importance of middle leadership to increase the school leadership capacity has been widely recognised, and school principals have often applied dispersed leadership, as underlined by De Nobile (2018) and Harris (2003), in order to meet the high goals set for their schools. For this reason, the workload of middle leaders has increased considerably, since they have assumed more duties, and because of a reduction in the number of professionals in middle leadership positions, due to financial crises (Lárusdóttir and O'Connor, 2017).

Middle leaders lie hierarchically between the teachers (and other staff) and the senior leadership, and hold titles such as department head, school division coordinator, subject coordinator, year-level coordinator, and so forth, depending on the context, as pointed out by authors like Gurr (2021), Dinham (2016), and Fleming (2014), in schools where they are accountable for leading and managing departments, programmes, projects, processes, and staff members, as well as for implementing policies and improvement initiatives set by their senior leaders (Lárusdóttir and O'Connor, 2017; Bennett et al., 2007), often in alignment with the wider school community (De Nobile and Ridden, 2014).

They can be non-teachers or teachers who still engage in classroom teaching (De Nobile, 2018; Edwards-Groves et al., 2016), and they normally strive to promote the smooth run of the area in their care within the school.

It is complex, though, to define middle leaders in terms of the roles that they play, since these are not necessarily implied in the title of their position, and there are no conventional criteria to categorise them, as remarked by De Nobile and Ridden (2014), who have noted an evolution of the roles played by middle leaders in schools, from trivial administrative tasks to strategic leadership roles. The authors share that they themselves have seen, while carrying out research, in different education systems, *“deputies who were given mundane administrative duties in one school, and coordinators who had significant strategic roles, similar to senior leaders, such as leading school change, in another school”* (p.3).

## Enabling Factors that lead Middle Leaders Towards an Effective Professional Performance

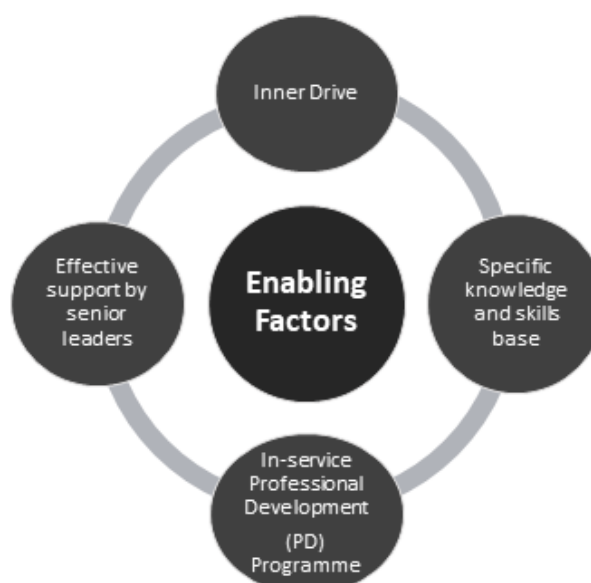
The work of middle leaders is heavily dependent on how their leadership position and roles are defined and their daily work supported, as well as on how their knowledge and skills are acquired and developed within their contexts (Gurr and Drysdale, 2013), considering that skills are particularly sensitive to cultural nuances and underpinned by the core values of each individual (Coleman and Glover, 2010).

The key factors that enable middle leaders to perform their roles with efficacy include a formal leadership position, access to expertise, support by senior leadership (Gurr, 2021; Gurr and Drysdale, 2013), and an effective PD programme in service to address their development needs (Pont et al., 2008).

Irvine and Brundrett (2016, p.89) denominate as 'factors that enable the middle leader' a number of aspects of personal, professional and organisational nature, such as *“a clear objective; knowing where they want the department to go, and articulating it to their team”*, i.e 'a vision' for the area under their responsibility. De Nobile (2018, p. 401) identifies, in the literature, five factors which he names as 'inputs', in his Middle Leadership in Schools (MLiS) Model, considered to influence the work performance of middle leaders: principal support, school/system culture, professional development, enthusiasm/drive, and knowledge of curriculum, pedagogy and assessment. Similarly, the *“contributing strategies in middle leaders who promote success”*, contemplated in Gurr's (2021, pp.7-8) analysis of a study undertaken by Dinham (2007), include being generally well-liked and trusted.

This study has identified four essentially important enabling factors that lead middle leaders to an effective professional performance (Figure 1): inner drive (or intrinsic motivator factors); a specific knowledge and skills base; in-service professional development (PD) programme; and effective support by senior leaders.

**Figure 1.** Enabling factors that lead middle leaders to an effective professional performance



### **A. Inner Drive (also known as Intrinsic Motivation or Intrinsic Motivator Factors)**

Deci and Ryan (2008) define *intrinsic motivation* as a drive that comes from within, also known as an *inner drive*, which is a feeling boosting the worker to behave in positive ways. Fullan (2016, pp. 6-7) provides examples of *intrinsic motivator factors* that include a “*feeling that the person has a degree of autonomy in what he/she does; a sense of purpose; a growing mastery or expertise; a strong identity with colleagues; a sense that he/she is making a difference in the workplace*”. De Nobile (2018) and Dinham (2016; 2007) recognise *enthusiasm, passion for education, and strong commitment to perform the roles the best way possible* as important sources of intrinsic motivation for middle leaders.

### **B. Specific Knowledge and Skills Base**

Middle leaders need to acquire and constantly update a specific set of knowledge. The research of Thorpe and Bennett-Powell (2014, p.54), undertaken in the U.K., reveals that the specific knowledge that effective middle leaders should have include: time management skills; knowing how to be accountable for others, especially for a disparate teaching team; monitoring and holding team to account; a better understanding of data analysis, mainly relating to student assessment; embracing the leadership of curricula of school subjects that are not their field of expertise; and providing effective PD for teachers, especially in terms of preparing and delivering adequate training sessions to the teaching staff.

In New Zealand, Highfield's (2019) research uncovers that the middle leaders need to acquire and develop a breadth of knowledge of curricula and of current developments in their field. Likewise, Steward (2020) claims that middle leaders need to have a good understanding of how curriculum works, both at subject and at whole school level; a sophisticated understanding of contemporary pedagogy; and a clear comprehension of the whole school policy.

As for the specific skills of middle leaders, Highfield (2019) identifies a range of them: strong communication and interpersonal skills; ability to keep staff motivated; ability to take a leading role in programme design; leadership skills as a team leader; strong focus on academic and social outcomes for learners; ability to influence evidence-based department planning and organisation. Steward (2020) adds that middle leaders need to have the ability to align the objectives of the area they lead with the wider aims of the school. Dinham (2007) outlines the main skills and attitudes that enable middle leaders to have a positive impact on student learning, highlighted in Gurr's (2021, pp. 7-8) analysis, as 'contributing strategies identified in middle leaders that promote success' (as mentioned before). The skills identified include: excellent communication skills; strong team leadership skills; ability to develop a culture of success, and of shared responsibility and trust; ability to develop a common purpose; and ability to keep the teaching staff motivated and committed with their own continuing learning.

### **C. In-service Professional Development (PD) Programme**

Pont et al. (2008) claim that middle leaders need a PD programme in-service to respond to broadened roles and responsibilities, and that it should be approached as a continuum process rather than through their participation in sporadic activities and events. The authors claim that the PD programme should include an induction course when the middle leader assume his/her

position, in addition to training sessions on-site, and incentive for them to attend courses at external institutions when appropriate.

Irvine and Brundrett (2016, p.86), reporting on some perceptions shared by middle leaders on a study undertaken in England, claim that “*middle leaders taking on leadership roles need a different set of knowledge and skills to that of the classroom teachers, yet many of them not always receive appropriate training or guidance on leadership development*”, and argue that the factors that enable middle leaders to overcome various challenges that they face are those that can be learned through a well-structured leadership development programme.

In another study, Irvine and Brundrett (2017) state that, even when the professionals have a previous experience in middle leadership, they will need to learn, adapt, develop, and integrate a new set of knowledge and skills into their repertoire, reinforcing that educational leadership is contextual, and that a PD programme on-site is necessary to address a range of individual development needs.

Authors like Thorpe and Bennett-Powell (2014), Jones (2005), and Adair (2004) note that the capabilities required to lead high-performance teams effectively may not come naturally to many team leaders, so this is another reason why middle leaders should be provided with a PD programme at work.

Also, studies such as those carried out by Gurr (2021), Noman and Gurr (2020) and Drysdale (2011), focused on reviewing research on the effectiveness of middle leaders in more than twenty countries, claim that, even when middle leaders have a solid repertoire with a set of core practices, they will only succeed upon the enactment of such practices, in direct response to their own unique contexts.

Another aspect to consider, as Irvine and Brundrett (2016, p. 91) have noted, is that teachers appointed to formal leadership positions for the first time, known as 'emergent leaders', need a different set of knowledge and skills of that of the classroom teachers, which is distinct from that of a more experienced leader, which means that only a well-planned PD programme in-service would address such a range of needs.

Hence, it is unquestionable that an in-service PD programme especially tailored to meet the needs of the (middle)leadership team, as also advocated by Darling-Hammond and Richardson (2009) and Pont et al. (2008), at both individual and collective levels, in alignment with their context, is one of the main enabling factors capable of impacting the performance of middle leaders.

The research of Wells (2013, p.490) uncover that, to be effective, a PD programme needs to help the participants to build their knowledge and skills; be grounded in local knowledge and experience; be ongoing and personally active; be school-based; include input from experts when needed; promote research as a core practice, include investigations in which data are collected, analysed and acted upon to change practice; be embedded in the daily work of middle leaders; be collaborative, in nature, by building a culture of inquiry and reflective practice; be connected with the particular educational context; and provide support as needed, such as coaching and mentoring.

At last, Thorpe and Bennett-Powell (2014, p. 52) underline that the school context can either promote effective PD initiatives or limit them.

## D. Effective Support by Senior Leaders

De Nobile (2018, p. 401) claims that the senior leadership's support is the factor that has emerged as mostly impacting the professional performance of middle leaders, and argues that 'empowerment' and 'autonomy', underpinned by 'trust' should underlie this support.

Authors like Harris and Jones (2016) also claim that the quality of middle leadership is heavily determined by the extent to which they have 'autonomy' and 'responsibility' to engage with senior leaders and teachers in supportive and innovative ways.

Two other positive aspects are 'camaraderie' and 'collaboration', as many studies have shown, including the ones undertaken by Dinham (2007), Fullan (2016), and the OECD (2019b), which claim that collaborative work between senior, middle leaders and teachers, within a good school climate, can shape the quality of instruction and make a profound impact on students' learning outcomes.

## Methodology

For the purpose of this research, a qualitative educational case study was undertaken, focused on increasing understanding about aspects concerning the professional performance of a team of educational middle leaders responsible for the lower elementary school division of a private mainstream school located in Brazil, within the time-frame of 2021.

Bassey (2012, p. 156) defines educational case study an empirical enquiry about a singularity, undertaken within a localised boundary of space and time, through an in-depth study on interesting aspects of an educational activity, programme, institution, system or work of individuals, mainly in their natural context, and within an ethic of respect for persons; whilst Merriam's (1998, p. xiii) definition is that it is "*an intensive, holistic description and analysis of a bounded phenomenon such as a program, an institution, a person, a process, or a social unit*".

Yin (2009) argues that case studies call for an intensive and in-depth focus on a specific unit of analysis, so they generally require a much smaller sample size than other methods. As such, the six the middle leaders and their senior leader were invited to participate in the research. Five middle leaders and the principal agreed to participate.

It is relevant to highlight that all the ethics related issues were considered quite carefully throughout the development of the case study. Also, the Ethics Form was submitted and approved (in advance) by the University College London (UCL). The study followed the ethical guidelines provided by the British Educational Research Association (BERA). The main ethical aspects considered were: Invitation Letter and Formal Consent; Information Letter and Informed Consent Form; Right to Withdraw; Confidentiality and Anonymity; Harm or Discomfort Arising from Research; Data Storage and Privacy of Participants; and Dissemination and Use of Findings. As such, the proper names of the participants used in this paper are not their real names.

Additionally, an important sampling aspect considered was that the researcher was no longer a member of the middle leadership team, after having worked in that context for a couple of years until the end of 2020, thus, in order to ensure that the data collected would not lead to uncomfortable feelings by the participants, as predicted by Hofstede (1997), only two

research tools were used: an electronic questionnaire and semi-structured individual face-to-face interviews.

For the electronic questionnaire, all the middle leaders were invited, whilst for the interviews, the researcher used her own judgment to select three interviewees among the five middle leaders available, as well as their senior leader, thus a purposive sampling has been carried out (Muijs, 2012; 2010).

Briggs et al. (2012) remind that questionnaires allow participants to anonymously express themselves; and advise researchers to clarify the questionnaire statements in order to increase their effectiveness, which the researcher did.

However, as Bell and Woolner (2012, p. 266) remark, it is actually quite challenging to design good questionnaires and to interpret their results, so the effectiveness in utilising them should never be taken for granted.

As for the interviews, they were all conducted on the same day, and the researcher recorded them by using two different electronic devices. The meeting room was next to the main entrance of the school, therefore, it was a bit noisy most of the time. Two interviewees took their face masks off (an accessory item that was necessary due to the coronavirus pandemic), and spoke closer to the electronic devices to help the researcher.

Coleman (2012) considers interviews as a key tool in qualitative research, whilst Cohen et al. (2011, p. 267) claim that interviews are intersubjective, since they enable both researcher and participants to discuss their interpretations of the world, and to express how they perceive their surroundings; therefore, this research tool is not merely concerned with collecting data about life, but it is actually part of life itself, as it fosters an immersion into human thought and emotions.

Alvesson (2003) advises qualitative researchers to consider the impact of the social setting in which the interview takes place, as well as the physical setting, and the impact of language on the interview, which means, for instance, that the use of expressions with which the interviewee is unfamiliar should be avoided.

Prior to the interview, the researcher spent 5-10 minutes creating a favourable environment by thanking each interviewee, explaining the purpose of the study, reading the instructions on how to respond the questions, and clarifying aspects previously stated in the informed consent form, including confidentiality, anonymity, voluntary participation, and the option to withdraw at any point. Then, the researcher asked for permission to voice record the conversation for transcription, and to take notes.

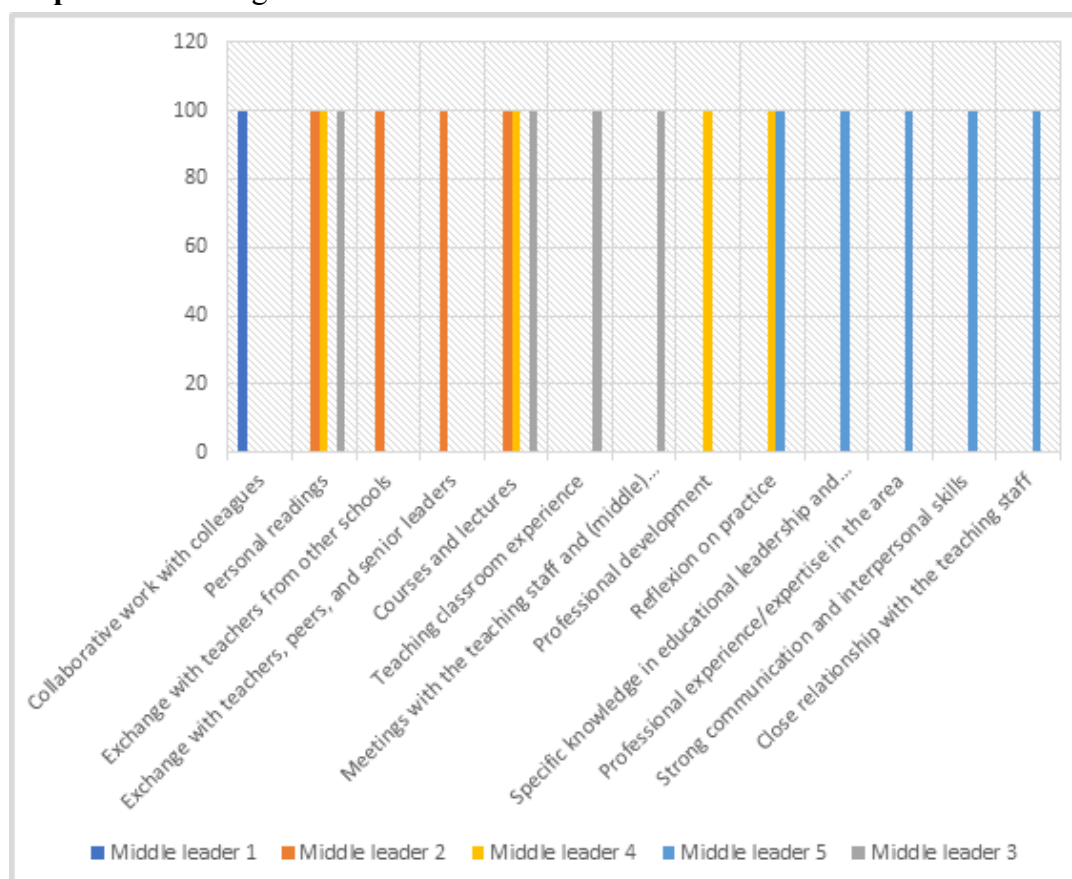
Data generated from the electronic questionnaire and interviews were recorded, transcribed, translated, coded and analysed, along with notes featuring non-verbal content taken by the researcher during the interviews, through thematic and constant comparative analysis.

Finally, when referring to the data analysis of case studies, Lincoln and Guba (2002, p.32) claim that *“it is far easier, and more epistemologically sound, simply to give up the idea of generalisation”*, arguing that, in case any generalisation is considered, it should be time and context bounded, indeterminate and relative. In this case study, generalisations of all kinds were avoided.

## Data Presentation and Analysis

In the electronic questionnaire, the set of questions posed to each participant included the following: “*What are the enabling factors that lead middle leaders like you to an effective professional performance?*”. Their answers revealed the enabling factors identified in the first phase of the data collection process.

**Graphic 1.** Enabling Factors Identified in the 1<sup>st</sup> Phase of the Data Collection Process



Thirteen factors were pointed out in the questionnaire (Graphic 1). The ones cited by more than one respondent were 'personal readings', 'courses and lectures', and 'reflection on practice', drawing the attention to the fact that the middle leaders were probably making their own efforts towards enhancing their professional performance.

During the interviews, the same question was made by the researcher on a face-to-face format. Following, an analysis on the responses and reactions of the middle leaders and the principal during the interview, concerning the research question of this paper: “*What are the enabling factors that lead middle leaders like you to an effective professional performance?*”.

**Anna** exclaimed "Wow!", and gave a giggle whose meaning was hard to interpret. The researcher paraphrased the question. Then, Anna provided a long answer perceived as redundant and vague, which helped with the interpretation of the initial interjection of surprise as if Anna was not keen on talking about the topic: “*I think that **time** for being with the teachers; **time** for discussions between the middle and senior leaders (...) **time** for the meetings to promote these exchanges and conversations (...) **time** with teachers for training, discussion, talking about the students (...) **time**”.*

The researcher explored the topic a little more by asking Anna: *“As you're placing an emphasis on the need for time to take care of so many issues, could you tell me whether you think that you have managed your time with efficacy?”* Anna quickly answered “Yes!”, and cited all the different meetings that she had with her colleagues (and she started snapping her fingers, and turning around a ring that she had on one of her fingers): *“Yes, yes...I have meetings with the teachers every other week. (...) there are our meetings between the senior and middle leadership teams (...)”*.

Unlike Anna, **Ellie** seemed quite comfortable with the question. She contextualised her middle leadership position as someone lying between the top and the bottom of the pyramid, and highlighted aspects such as 'being listened to' and 'having the needs attended (those of hers and of her team)', and 'working with freedom and autonomy' as the main enabling factors in her opinion: *“Listening to what the team demands, right? Besides being a representative of the institution, I represent the team of educators that I lead, right? So, an enabling factor is having the opportunity of being listened to, of having the needs met, as well as having freedom and autonomy to work... I think these are the most important things”*.

Alike Ellie, **Bea** seemed excited with the opportunity to discuss about that topic. She cited that having self-confidence and some skills including 'flexibility' and 'active listening', in addition to having the work valued by the institution were important enabling factors: *“Having flexibility and good listening skills (...) believing that your role can contribute with the progress of the school work (...) the school valuing the work of middle leaders...”* Then, she mentioned other aspects, such as 'support', 'recognition' and 'credibility by the different stakeholders': *“(...) the resources that the school provides, so that the work can be executed... the credibility of parents, families and the team (...) they are facilitators. I think that they all make the difference”*. She concluded by emphasising the relevance of having specific knowledge on the curriculum taught to the school graders in her care: *“One thing that is also an enabling factor is having the project of the school grade in your hand...this is a great facilitator, essential too”*.

The question posed to **Eve**, the lower elementary school principal, was quite similar: *“What are the enabling factors that are crucial to determine an effective professional performance by the middle leaders under your supervision?”*

**Eve** pointed out 'inner drive' and 'initiative to keep studying' as the two main enabling factors capable of leading the middle leaders to an excellent professional performance: *“Research... they need to study, they should not accommodate themselves, right? Study inside and outside of the school, join forums with other people, engage in conversations in interschool forums, so that they don't get stuck in their own standards, in their own way of doing things, right?”* Eve finished her response by emphasising that *“there's nothing ready, there's no technique, thus the middle leaders should take the initiative of keep studying”*. Her viewpoint was interpreted as if it was 'incompatible with the expectations demonstrated by the middle leaders', mainly those expressed by Bea and Ellie.

## Conclusions

This paper has originated from a qualitative educational case study carried out in 2021 in Brazil, and submitted to the UCL in 2022, which was centred in the professional performance of a group of middle leaders, led by a senior leader, applied to the context of the lower elementary school division of a private mainstream school.



It seems that it has fulfilled its main purpose, consisting in outlining how the specific topic *enabling factors that lead middle leaders to an effective professional performance* had been approached in the academic study.

As shown throughout the paper, four enabling factors were identified and addressed in depth in the academic study: an inner drive or motivator intrinsic factor(s), a knowledge and skills base in leadership and management, an effective support by the senior leadership, and a well-structured PD programme for the middle leadership team in-service.

Regarding the enabler *inner drive*, the main factors uncovered as impacting the professional performance of the middle leaders who participated in the empiric research were a 'strong identification with the institution', 'a sense of belonging and proud', and 'freedom and autonomy to work'.

The three remaining enabling factors were perceived as either missing or insufficient. The school did not have a PD programme in place for their middle leaders, whose members were quite skilled and experienced in the field of teaching, among other areas, but were aware that lacked from a set of specific knowledge and skills in leadership and management, which would likely benefit them at work.

Additionally, although the middle leaders demonstrated an ethical and positive attitude in relation to their senior leader, with whom they seemed to maintain a good interpersonal relationship, it is pertinent to emphasise that it has been perceived that the principal was not used to providing her middle leaders with effective support, within a demanding context where all middle leaders were encouraged (by her) to be highly committed with their own professional development, as well as with that of the faculty staff members in their care.

The improvement initiative of having a structured PD programme as a common goal within their school division, through which they would be able to develop together, would likely enable them to maximise their individual learning achievements, and best impact their professional performance.

## **Acknowledgement**

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***Fuzzy Based Model for Students Debar Policy in Indian Engineering Institutes***

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**Abstract**

All around the world, a critical aspect of the higher education system is the evaluation of students through periodic examinations. To exemplify, many higher education centers in India allow students to undertake rigorous semester-based examinations i.e., End-Semester (or End-Term) examination, provided they meet the criteria of class attendance up to a certain percentage. However, below the mandatory percentage, the students are considered debarred from the examination. There are several instances been observed, especially since the Covid-19 cases arrived in India, where students have missed their classes due to genuinely unfavorable causes. In such cases, debarring students due to insufficient classroom attendance is unfair and this can affect students' careers in adverse ways. To work in this direction, this paper analyses a computational model that takes into account multiple parameters reflecting students' performance to determine whether they should be allowed to undertake the End-Term examination or not. The proposed model implements the machine learning-based K-means clustering and Fuzzy Modelling techniques, as an inclusive approach for strategic examination of debarred policy in engineering institutes. It is observed that in comparison to other existing models, quite fewer students are declared as debarred using the proposed model. To the best of the authors' knowledge, no such system exists to date.

**Keywords:** Machine Learning, K-Means, Fuzzy Logic, Class Attendance, Engineering Institute, Examination Debar Policy, Performance Evaluation

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## 1. Introduction

In a higher education system, the teaching-learning process has undergone a drastic shift lately, especially since Covid-19 (Jain et al., 2021a) cases are observed not only in developed countries but also in developing countries such as India. The offline mode of teaching is mapped to online teaching using modernized tools and techniques of the learning process (Furlong et al., 2003; Fredricks et al., 2004). However, still few facets of educational practices are not yet garnered the attention of policymakers. One of these practices is the determination of examination debar criteria for students enrolled in undergraduate education.

In undergraduate or other higher education courses in India, examinations and their related procedures are considered a very important component for evaluating the students' overall performance. The semester-based evaluations, prominently End-Semester (or End Term) examinations are a way of validating the students' learning as well as their preparation for futuristic learning in their selected careers. However, most of the higher educational institutions in India allow only those students to appear for the end-term examinations who have attended their classes regularly during the entire semester. This is measured by the criteria of the number of classes attended by the student over a total number of classes being conducted by the institute/university, as in equation (1).

$$\text{Student Attendance (\%)} = \frac{\text{No. of classes attended by student}}{\text{No. of classes conducted by institute}} * 100 \quad (1)$$

This is quintessential since classroom participation is deemed important for students' learning and preparation for their examinations (Borland & Howsen, 1998; Moore et al., 2003; Veerasamy et al., 2018). The evaluation includes written examinations which in general, are permitted to be attempted by the students who have regularly attended their classes. A threshold of attendance percentage is decided by the institute or university and those students who do not possess the required threshold attendance are considered debarred from appearing in the examinations. The sole class attendance-based criterion for eligibility to appear for the examination is lopsided and unfair whenever students are involved in varied learning activities during the semester such as assignments, projects, reports, viva-voice, and so on. In addition, disparity in students' family, economic and cultural backgrounds also affect their regularity of attendance in classes. The debarring of students from appearing for the end-term examination that too due to inadequate class attendance leads to serious consequences upon students, ranging from loss of academic progress, dissatisfaction among students, loss of interest towards career, and personal side-effects (Avasthi et al., 2022) such as loss of self-confidence, self-esteem, mental stress, anxiety, etc.

To handle the examination-based debar problem, a computational model is proposed, taking care of an all-rounded evaluation of students learning. The proposed model works upon multiple parameters that are postulated with respect to students learning during the entire term or semester, not merely confined to classroom attendance. The multi-parameters include eight factors that highlight students' performance through varied aspects, for example, performance in previous examinations, regular involvement in subject-related activities, capability to prepare for examination independently, and performance in creative or intellect-based activities. Based on these parameters, an initial set of different fuzzy rules are framed. Fuzzy logic (Pandey & Jain, 2020) is chosen for solving the problem due to the inclination of domain experts for inferring the rules as well as due to the linguistic nature of the factors. By evaluating students in eight dimensions, a better-informed decision is made for the considered problem. However, the complexity in framing the fuzzy rules and their



implementation over a larger set of students is quite tedious to execute. In addition, unlabeled data cannot be classified directly using the machine learning (Jain et al., 2018) approaches. Therefore, the K-Means clustering algorithm (Jain et al., 2021b) is applied over the initial drawn fuzzy rules. The clustering is performed by assigning weights to eight attributes. Once the clusters are obtained, a refined set of fuzzy rules are framed based on the observations from the formulated clusters. Thereafter, the resultant generation of seven fuzzy rules is applied to solve the examination debar problem. Thus, the model provides an inclusive view of students' performance before imposing a decision to debar them from appearing in the end-term examinations. The research objectives of the proposed work are highlighted as follows:

- To propose a computational model that takes into account multiple parameters reflecting students' performance to determine whether they should be allowed to undertake the End-Term examination or not.
- To include a comprehensive set of domain-related eight parameters that encompass the students' overall performance and execute the debar decision in a better way.
- To apply clustering algorithm while assigning weights and to implement fuzzy modeling, in order to capture the linguistic nature of attributes and to prevent inaccuracies during quantification of attribute values.
- To develop a simple yet effective model while working with a small set of fuzzy rules to capture the domain knowledge.

The remaining paper is arranged as follows: Section 2 enlists the work done in the related domain. Section 3 puts forth the design of the proposed model. Section 4 explains the implementation results. Section 5 finally concludes the paper.

## 2. Related Work

The importance of efficient educational practices in higher education institutes is reflected by numerous studies mentioned below. These studies are carried out to emphasize students' facets such as their behavior, diversity in their habits, customizing study material according to their needs, and evaluating their performance. So that the examination debar policy can then be laid and implemented in a better way at the higher educational systems at different levels.

Yadav et al. (2014) have pointed out several cognitive factors that influence students' academic performance and hence, are not to be gauged by arithmetic techniques. Andrietti & Velasco (2015) have undertaken a study at a public university in Spain to evaluate the role of study time including self-study and class attendance of students on academic performance. Their study has suggested that attendance has a lesser effect on academic performance than study time. Barlybayev et al. (2016) have proposed a qualitative method for the evaluation of student performance using Fuzzy Logic instead of traditional methods. Pani & Kishore (2016) have mentioned that high-performer students are lesser affected by absenteeism than low-performers students. They have conducted their study on the students in the British university campus in the Middle East. Odokuma & Obagbuwa (2017) have applied Fuzzy methods on the grounds that they can correctly capture the judgment of teachers through the Fuzzy Mamdani Inference system. Their system is developed to identify the students who have dropped out of higher educational institutions. This Fuzzy system classifies the students who are not performing well so that corrective measures are to be taken in this regard. Krouska et al. (2019) have underlined the benefits of customizing educational practices and evaluation methods based on students' requirements. Moores et al. (2019) have reviewed

studies that have investigated the determinants of attendance for a better understanding of improving attendance rates in higher education institutions. Fuzzy logic systems for students' evaluations have also been proposed by researchers (Gokmen et al., 2010; Petrudi et al., 2013; Yousif & Shaout, 2018; Othman et al., 2019). Apart from evaluations, another important aspect of higher education practices is the classroom attendance evaluation since it generally determines if students are eligible to appear in examinations. Researchers (Bennett & Yalams, 2013; Lukkarinen et al., 2016) have outlined the benefits of classroom attendance for students and have attempted to identify the common reasons for low-class attendance of students. Several studies have demonstrated that more classroom attendance has yielded improved performance of students. In addition, it has also been observed that students who are allowed to take the exams without attending classes regularly, often have some compelling reasons for not attending classes, or are able to prepare for the course on their own.

In a few instances, such as Baker et al. (2001) have observed that one of the main reasons for absenteeism in classes is due to improperly framed policies on absenteeism. Rodgers (2001) has stated that class attendance is not found to influence the students' performance. Massingham & Herrington (2006) have discussed the reasons for the non-attendance of classes. Their study has shown that many students are having compelling reasons for non-attendance. Singh et al. (2016) have designed a mobile app for a higher education institute. In their app, they have used two parameters namely- attendance and marks in the previous subject, in order to decide whether students should be debarred from the examination or not. Their approach is very harmful to the students, failing a course can imply failing subjects in a cascade without even having taken them. Jain & Jaggi (2020) have implemented the Fuzzy Logic-based attendance evaluation system. Their system considers attributes- student attendance in the current course, performance based on continual assessment in the current course, overall performance and assessment by faculty for deciding whether the students are to be debarred from the examinations, or allowed to take the examinations, or be given any kind of reconsideration. Chen et al. (2021) have worked with a mobile phone-based lightweight attendance system. They have recorded attendance by scanning QR codes for first-year college students. Their attendance control is done within one minute, so it is easy to cheat to save this requirement.

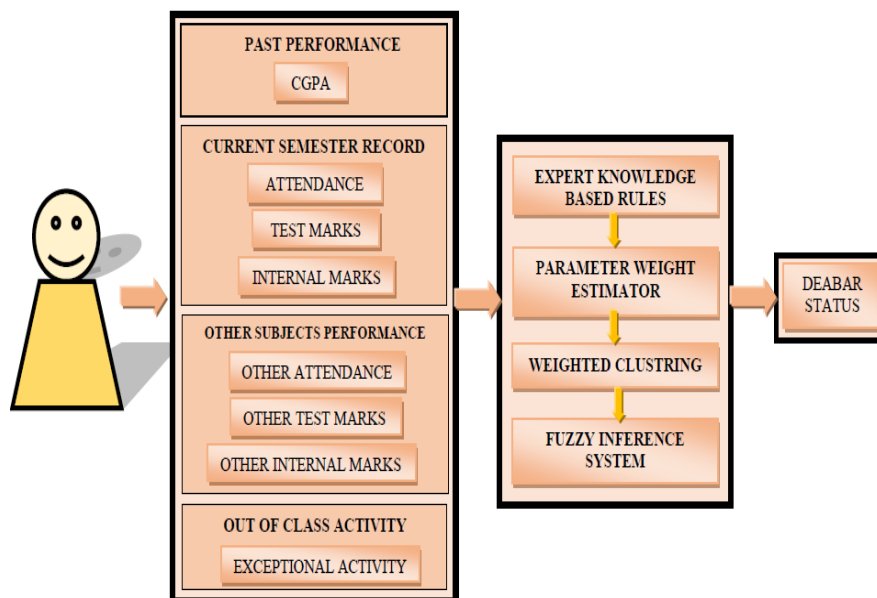
It has been inferred from the above studies that not many significant attempts have been made to develop an efficient or flexible attendance evaluation system in the context of the Indian higher education institutes. Compared with the above research, this paper presents a significant extension of the existing work (Jain & Jaggi, 2020). The proposed model is specifically aimed at closer scrutiny of students with lower attendance to check if they have met other related criteria or not. For the sake of the same, eight parameters are considered to make the model more robust. Fuzzy logic is integrated with K-means clustering to obtain satisfactory results in domain-based expert knowledge and is marked by subjectivity.

### **3. Proposed Computational Model**

The classroom attendance of students is computed as a percentage of classes the students have attended for their courses. The higher educational institutes or universities usually employ this as the sole criterion for deciding whether students are allowed to appear for the end-term examination or not. However, in several instances, absenteeism of students from their classes is due to valid reasons, for example, medical emergency, placements/other employment-related activities, preparation for competitive examinations, participation in

various competitions, involvement in research projects, and so on. These students are capable to perform well in their examinations, provided they are allowed to appear for the exams by their institute/university.

In this section, a computational model for examination debar policy is proposed that evaluates multiple parameters related to students, before determining whether they are to be debarred from their examination. The proposed model is improvised over other existing approaches – Model 1 (Kassarnig et al., 2017) and Model 2 (Jain & Jaggi, 2020) since it undertakes a well-informed decision and thus, yields better results.



**Fig. 1.** Proposed computational model for examination debar policy.

Fig. 1 illustrates the proposed model that evaluates students based upon 8 attributes within 4 defined categories. The first category is related to the past performance of students and extracts their Cumulative Grade Point Average (CGPA) as an important value. The second category of attributes is related to the performance of students within the ongoing subjects under consideration. This category includes values for students' attendance in the subject, marks in the exams held (such as test 1, and test 2) during the term for the subject, and the teacher's assessment marks based on class projects, assignments, etc. The third category of attributes is related to the performance of students in other subjects in the current term. The fourth and last category of attributes is related to the evaluation of whether the students have undertaken any creative or exceptional activity in the semester which is out of a specific subject's realm. All the above categories and their related parameters constitute input variables, and there is a sole output variable, i.e., "*is\_debarred*" for the proposed system. All of them are explained in detail as stated below.

### 3.1 System Variables

There are two types of system variables under consideration, i.e., Input variables and Output variable. Each one of them is discussed here one by one.

**Input Variables.** The input variables are divided into 4 categories (Category I-IV), where each category has its own set of variables to work with, totaling 8 parameters. Each one of

them is detailed here. It is noted that the value of each input variable is normalized on a scale of 0 to 1.

*Category I.* The variable of this category represents the past performance of students. This category includes the variable name “*preMarks*” which is discussed here.

1. *preMarks*: This attribute reflects the students’ performance in general, till-date. It is included in decision making since it is useful to identify otherwise good students who have attended fewer classes in the current subject, maybe due to some valid reasons in the present time.

*Category II.* The variables of this category represent the performance of students in the ongoing subjects under consideration. This category includes the variable names “*subjAttendance*”, “*subjTestMarks*”, and “*subjInternalMarks*” that are discussed here.

2. *subjAttendance*: This attribute stands for the percentage of classes of the current course attended by the students and is specified in percentage.

3. *subjTestMarks*: This attribute corresponds to the performance of students in an examination that is held during the term for the course whose attendance is being evaluated.

4. *subjInternalMarks*: This attribute inculcates the subject teacher’s evaluation of subject-related activities undertaken by the students. This includes project development, timely assignment submission, etc.

*Category III.* The variables of this category represent the performance of students in other subjects. This category includes the variable names “*otherAttendance*”, “*otherMarks*”, and “*otherInternalMarks*” that are discussed here.

5. *otherAttendance*: This attribute is used to gauge the attendance of students in other courses they are offered during the current term. The comparative better attendance records in most other courses indicate that there is some problem faced by the students while attending the classes of a particular subject.

6. *otherMarks*: This attribute is used to obtain a view of how the students have fared in the examinations of subjects other than the one being considered.

7. *otherInternalMarks*: This attribute is used to remove any biased or unfairness in evaluation. This parameter captures the average evaluation of students by other subjects’ teachers.

*Category IV.* The variable of this category takes care of the performance of students in creative or intellect-based activities. This category includes the variable name “*exceptionalActivity*” which is discussed here.

8. *exceptionalActivity*: This attribute gives credit for any innovative or creative work that is done by the students in the current term. Such activity has taken up most of the time from students’ curriculum and so is essential to consider.

**Output Variable.** There is one output variable, “*is\_debarred*” that denotes the decision whether students are debarred or not from the end-term examination in the institute.

### 3.2 The Computational Model

The proposed computational model is explained here in four consecutive steps, Step 1-4 respectively. As is explained in the above section, the model undertakes eight input parameters (“*preMarks*”, “*subjAttendance*”, “*subjTestMarks*”, “*subjInternalMarks*”, “*otherAttendance*”, “*otherMarks*”, “*otherInternalMarks*”, “*exceptionalActivity*”) and generates an output whether students should be debarred from their end-term examination or not.

**Step 1.** In this step, all the stated 8 attributes are considered together to comprehensively represent the students’ performance and to conclude the fair and informed decision on whether students are allowed to appear for the final end-term examination or not. To do so, knowledge from experts is gathered from the faculties of higher educational institutes, based upon which fuzzy rules are generated. These fuzzy sets of rules are in terms of if-conditions such that they are sufficient to establish the relationship between input variables and output attributes. The nature of if-conditions is linguistic, so their quantification leads to certain inaccuracies in the model. Hence, fuzzy modeling is deemed appropriate to represent the proposed system. However, fuzzy rules that are framed on the basis of the choice of attributes are too large in number. For example, considering 3 classes for each attribute can have 38 rules, which faces severe challenges while framing the exact rules for any domain expert as well as during implementation. Moreover, the input variables have some weighted impact on the output. So, it is important to assign weights to these variables and accumulate them, in order to reduce the total number of variables to be processed by the system. Here, the weight of each attribute denotes its importance in fuzzy decision-making.

Consider the attribute of “*subjAttendance*”, if students have good attendance in their subject, irrespective of the value of other attributes, they should be allowed to appear in the examination. Hence, the attribute weight equals the sum of weights of all other attributes, and so is assigned to this attribute. In addition, the weight of “*exceptionalActivity*” is the same as the sum of weights of the three attributes that represent other subjects (“*otherAttendance*”, “*otherMarks*”, “*otherInternalMarks*”). Hence, assigned the weight of 1 unit to each of these three attributes, and a weight of 3 units to “*exceptionalActivity*”. Also, equal importance is given to the attributes- “*preMarks*”, “*subjTestMarks*”, “*subjInternalMarks*”, and “*exceptionalActivity*”, hence, the same weight is assigned to each of these attributes, i.e., the weight of 3 units each.

**Step 2.** In this step, the attributes are aggregated together and normalized to form a single compound attribute, “*compound\_attribute*” as is in equation (2).

$$\begin{aligned} \text{compound\_attribute} = & \\ & (\text{preMarks} * 3 + \text{subjTestMarks} * 3 + \text{subjInternalMarks} * 3 + \text{otherAttendance} * 1 + \\ & \text{otherMarks} * 1 + \text{otherInternalMarks} * 1 + \text{exceptionalActivity} * 3) / 15 \end{aligned} \quad (2)$$

**Step 3.** In this step, unlabeled students’ data is collected from four engineering institutes in India. Here, a clustering-based K-means algorithm is applied to the resultant two attributes, namely- “*subjAttendance*” (Step 1), and “*compound\_attribute*” (Step 2) to formulate two clusters. It is observed that the cluster that contains data of high attendance of students, in addition to other data belongs to non-debarred students. However, another cluster represents the debarred students.

**Step 4.** In this step, the output obtained from the previous step (Step 3) is analyzed to obtain the correlation of “*subjAttendance*”, and “*compound\_attribute*” with the output variable “*is\_debarred*”. Further, the input variables are now represented via three defined Fuzzy Sets [30] - “*high*”, “*medium*”, and “*low*”. The output variable is represented using two defined Fuzzy Sets: “*yes*” and “*no*”. Here, “*yes*” indicates that the student is debarred, and “*no*” indicates the student is not debarred from the examination. Also, the correlation is represented using the 7 defined Fuzzy Rules over the two input attributes (“*subjAttendance*” and “*compound\_attribute*”) and one output attribute (“*is\_debarred*”). Finally, the Mamdani Inferencing method [10] is applied to determine the debar decision of students, and thence, Fuzzy Inference System (FIS) is designed. Table 1 represents the 7 stated Fuzzy rules.

**Table 1.** Fuzzy rules for students debar decisions.

	Inputs		Output
	<i>subjAttendance</i>	<i>compound_attribute</i>	<i>is_debarred</i>
Fuzzy Rules	High	-	no
	Medium	high	no
	Medium	medium	no
	Medium	low	yes
	Low	high	no
	Low	medium	yes
	Low	low	yes

## 4. Implementation and Results

### 4.1 Dataset

In order to test the performance of the model, data from 1,074 students in the age group of 18-24 years is collected from four engineering institutes in India. It is observed that the data is scattered over the range and is unbiased. The debar criteria do not depend upon the gender of students, therefore it has not been discriminated against. The proposed model is implemented using the Fuzzy Toolbox of OCTAVE (Markowsky & Segee, 2011). Table 2 represents the sample snapshot of the students’ dataset which comprises “*sid*” (student unique identification), and 8 input parameters (“*preMarks*”, “*subjAttendance*”, “*subjTestMarks*”, “*subjInternalMarks*”, “*otherAttendance*”, “*otherMarks*”, “*otherInternalMarks*”, “*exceptionalActivity*”) respectively.

**Table 2.** Sample student dataset.

<i>sid</i>	<i>preMa</i>	<i>subjAttend</i>	<i>subjTest</i>	<i>subjIntern</i>	<i>otherAtten</i>	<i>other</i>	<i>otherInter</i>	<i>exceptionalActivity</i>
	<i>rks</i>	<i>ance</i>	<i>Marks</i>	<i>alMarks</i>	<i>dance</i>	<i>Marks</i>	<i>nalMarks</i>	
1	0.7	0.22	0.55	0.6	0.15	0.87	0.08	1.0
2	0.2	0.52	0.10	0.4	0.73	0.9	0.64	1.0
3	0.1	0.46	0.13	0.76	0.37	0.97	0.96	0.9
4	0.8	0.46	0.13	0.16	0.46	0.67	0.68	0.9
5	0.9	0.26	0.63	0.32	0.53	0.00	0.44	0.3

### 4.2 Results and Discussion

The proposed model once simulated, is compared with two different existing models- Model 1 (M#1): Kassarnig et al. (2017), and Model 2 (M#2): Jain & Jaggi (2020).

Table 3 shows excerpts from the data samples with respect to the three models. The comparison is performed for all of the 1,074 students' data.

In Model 1, the decision to debar students is based only on classroom attendance. If their attendance is lesser than a threshold, students are simply debarred. They are not been able to take their examination in this case. In Model 2, the decision to debar students is based upon three parameters but is specific to the subject under consideration. In this method, students are debarred from their examination through “*debar\_yes*” or allowed to take their examination through “*debar\_no*”, or are given reconsideration through “*conditionalNo*”. The “*conditionalNo*” parameter is to be resolved based on the subject teacher's discretion. In this case, there are chances that the decision may be biased or cause dissatisfaction among students. To overcome these facets, the proposed computational model looks upon eight parameters that encompass the students' overall performance and executes the debar decision in a better way. Further, the final decision is achieved as “*yes*” or “*no*”, thereby, removing any uncertainty in the decision to debar students or not.

**Table 3.** Excerpts from data samples with respect to comparative models.

<i>sid</i>	<i>pre Ma rks</i>	<i>subjA ttend ance</i>	<i>subjT estM arks</i>	<i>subjI ntern alMa rks</i>	<i>other Atten danc e</i>	<i>other Mark s</i>	<i>other Inter nalM arks</i>	<i>excep tional Activi ty</i>	Model Type		
									M#1	M#2	Prop osed
1	0.7	0.22	0.55	0.6	0.15	0.87	0.08	1.0	yes	yes	no
2	0.2	0.52	0.10	0.4	0.73	0.9	0.64	1.0	yes	yes	no
3	0.1	0.46	0.13	0.76	0.37	0.97	0.96	0.9	yes	yes	no
4	0.8	0.46	0.13	0.16	0.46	0.67	0.68	0.9	yes	yes	no
5	0.9	0.26	0.63	0.32	0.53	0.00	0.44	0.3	yes	conditionalNo	yes
---	---	---	---	---	---	---	---	---	---	---	---
1070	0.2	0.55	0.30	0.36	0.28	0.7	0.88	0.1	yes	conditionalNo	yes
1071	0.2	0.49	0.95	0.08	0.39	0.95	0.24	0.1	yes	conditionalNo	yes
1072	1.0	0.54	0.28	0.12	0.68	0.47	0.56	1.00	yes	conditionalNo	no
1073	1.0	0.45	0.23	0.28	0.81	1.00	0.76	0.9	yes	conditionalNo	no
1074	0.4	0.52	0.80	0.4	0.76	1.00	0.96	1.00	yes	conditionalNo	no

Table 4 depicts the detailed description of the three models using different Cases, Cases 1-7 as discussed here.

**Case 1.** It is observed that out of 1,074 students, a total of 239 students are clearly not debarred using all three models.

**Case 2.** Out of the remaining 835 students (Case 1) who are declared as debarred using Model 1, a total of 246 students are declared to be in the same category by both- Model 2 and the proposed model.

**Case 3.** Out of the remaining 589 students (Case 1) who are declared as debarred using Model 1, a total of 80 students are declared to be in the same category by Model 2, however, are categorized as no debar by the proposed model.

**Case 4.** Out of the remaining 509 students (Case 3) who are declared as debarred using Model 1, a total of 138 students are declared to be in the “*conditionalNo*” based upon the teacher's discretion by Model 2, however, are categorized as debarred by the proposed model.

**Case 5.** Out of the remaining 371 students (Case 4) who are declared as debarred using Model 1, a total of 256 students are declared to be in the “*conditionalNo*” based upon the teacher’s discretion by Model 2, however, are categorized as no debar by the proposed model.

**Case 6.** Out of the remaining 115 students (Case 5) who are declared as debarred using Model 1, neither students are declared to be debarred by Model 2 nor by the proposed model.

**Case 7.** Out of the remaining 115 students (Case 6) who are declared as debarred using Model 1, all the 115 are categorized as no debar by Model 2 and the proposed model both.

**Table 4.** Case-wise comparison among models.

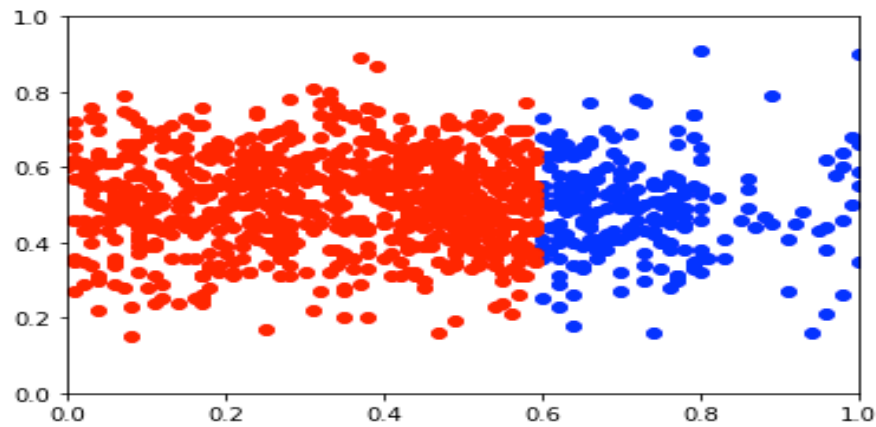
Cases	Existing Models		Proposed Model	Count of Students
	Model 1	Model 2		
Case 1	no	no	no	239
Case 2			yes	246
Case 3		yes	no	80
Case 4	yes	conditionalNo	yes	138
Case 5			no	256
Case 6			yes	0
Case 7		no	no	115

There are points to ponder from both Table 3 and Table 4 that are discussed here.

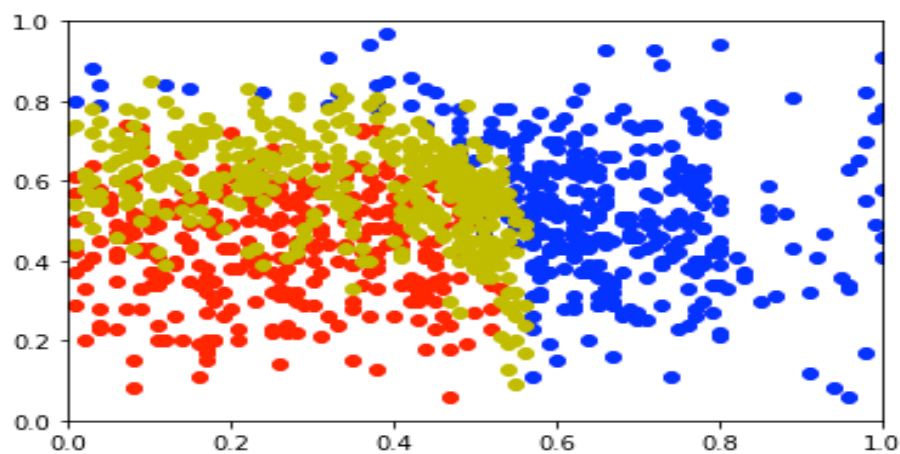
1. The example “*sid*” 1 to 4 (Table 3) corresponds to Case 3 (Table 4). Here, though the students are not doing well in the current subject, the performance in exceptional activities such as competitive programming, etc. are considered very good. Hence, these students are not debarred in the proposed model.
2. The example “*sid*” 5, 1070 to 1071 (Table 3) corresponds to Case 4 (Table 4). Here, these students are not performing well in the current subject, other subjects, and exceptional activities. Hence, they are declared as debarred in the proposed model.
3. The example “*sid*” 1072 to 1074 (Table 3) corresponds to Case 5 (Table 4). Here, though the students are not doing well in the current subject but are performing well in other subjects. There are 256 such students who are in the totally safe zone while considering their performance in other subjects as well and assessing their capability accordingly. Hence, these students are not debarred in the proposed model.

Figures, Fig. 2(a)-2(c) show the pictorial representation of students for debar decision over Model 1, Model 2, and proposed models. In these figures, red color dots indicate debarred students, blue color dots indicate not debarred students, and green color dots indicate conditionally debarred students respectively.

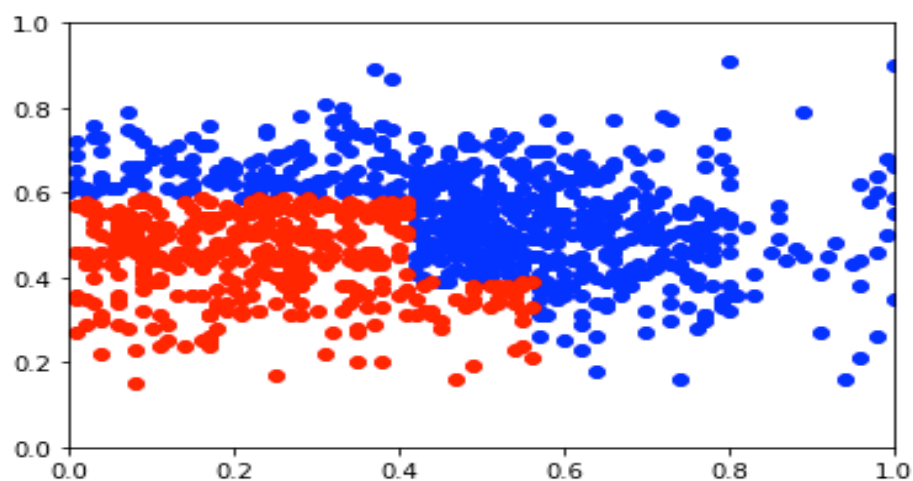




**Fig. 2(a).** Plot of Model 1.



**Fig. 2(b).** Plot of Model 2.



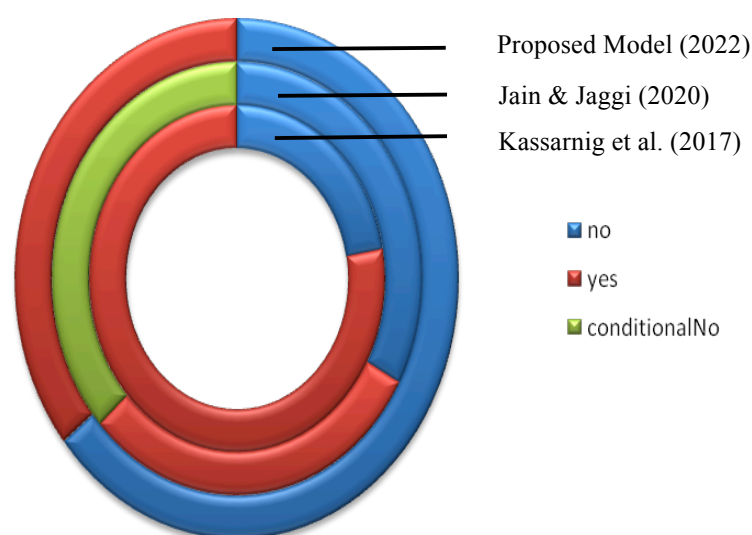
**Fig. 2(c).** Plot of Proposed Model.

Table 5 shows the detailed result analysis of the proposed work with respect to the total number of students, debarred number of students, and percentage of debarred students.

In each of the three comparative models, a total of 1,074 students are taken care of. Among them, in Model 1, 835 students are considered debarred (77.75%). While in Model 2, there are 720 students to be considered debarred (67.04%). Among them, 326 students are debarred and the rest of 394 students have “*conditionalNo*” which is conditionally debarred based upon the subject teacher’s discretion. However, in the proposed model only 384 students are considered debarred (35.75%). This clearly indicates that the proposed model allows more students to appear during their end-term examinations for higher studies. In other words, a lesser number of students are debarred using the proposed model in comparison with the rest of the models.

**Table 5.** Result analysis.

Count of Students	Type of Models		
	Model 1	Model 2	Proposed
Total	1074	1074	1074
Debarred	835	720	<b>384</b>
Debarred %	77.75%	67.04%	<b>35.75%</b>



**Fig. 3.** Comparative analysis of models.

Fig. 3 shows the resultant outcome of all three models- Model 1 (Kassarnig et al., 2017), Model 2 (Jain & Jaggi, 2020), and the Proposed Model. The proposed model is capable of including the performance of university students in each possible direction through various activities: in-classroom, out-of-classroom, innovations, and so on. The final decision that is made by the system is found to be a refinement of the two other existing models.

## 5. Conclusion

Examinations are a way of validating the learning of students, especially when these students are marching for their career paths. In engineering institutes, especially in India, disallowing them from appearing to take their End-Term examinations that too due to their classroom attendance is below the desired threshold, gives rise to dissatisfaction among such students. These practices are quite unfair to the debarred students, as they may be good in their performance. This paper works with a computational model that takes into account multiple 8 parameters under 4 categories to reflect the performance of students and to assess their eligibility for appearing in the examinations. The proposed model applies machine learning-

based K-Means clustering and Fuzzy modeling to solve the stated problem, currently in the context of Indian higher education institutes, and the results are compared with 2 other existing systems over a total of 1,074 students. In Model 1, there are 835 students as debarred (77.75%). In Model 2, there are 720 students as debarred (67.04%) i.e., 326 students are debarred, and the rest 394 students are conditionally debarred based upon teacher discretion. In comparison to these models, the proposed model undertakes only 384 students as debarred (35.75%) i.e., allows more students to appear during their end-term examinations for higher studies. In other words, a lesser number of students are debarred using the proposed model in comparison with the rest of the models. This decision is based upon domain expert knowledge that believes in giving chance to students who have not attended their classes regularly due to some valid reasons but have shown good performance in other assessable parameters. The proposed model successfully addresses diversity in students' requirements and allows them to undertake their academic performance for fair assessment through end-term examinations.

In the future, more insight parameters can be incorporated, a deep learning approach can be applied (Al-Amoudi et al., 2022) and the dataset can be extended for other countries and other fields of study.

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## ***International Collaboration in Higher Education: A Reflection of Student and Lecturer Experiences***

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### **Abstract**

The influence of international collaboration opportunities on student and lecturer experience in higher education is unmistakable. Not only do international collaboration projects provide the opportunity for internalisation, the improvement of cultural sensitivity and understanding, as well as problem-solving in culturally diverse teams, it also provides a reflection opportunity for lecturers on current lecturer teaching practices and how teaching practices can be improved. As a result, most higher education institutions are starting to include international project-based learning projects. This paper is based on one of the international teaching mobility projects of the NWU, Centre for Teaching and Learning, that focuses on transforming university teaching, learning and research, which is in line with the National Framework for Enhancing Academics as university teachers (DHET, 2018), the UCDG (Draft Ministerial Statement 2012-2023) and the NWU Annual Performance Plan (APP). The project entailed that students from different international universities, including students from Indonesia, South Africa, the Netherlands, and Canada, work together in teams on a 24-hour design thinking project. This paper outlines the international collaboration project, provides the background of the project, a reflection on the student and lecturer experiences, and concludes with an action plan for future international collaboration projects.

**Keywords:** International Collaboration, Project-Based Learning (PBL), Internationalisation of Teaching and Learning, Higher Education

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## Introduction

The difficulties faced by many students in higher education are understandable; not only are they faced with demanding academic ability (hard skills), but they also need to improve their soft skills before entering the real world of work after completing their studies (Indrawan et al., 2018). Over the last couple of years, the topics of modernisation in the higher degree education environment have brought about a particular focus on the introduction of project-based skill mastering activities where students are empowered to develop their competencies and skills, which enables them to complete complex projects and initiatives (Veselov et al., 2019). According to Vogler et al. (2018), higher education institutions have been increasingly focused on providing students with the opportunity to develop soft skills (problem-solving & teamwork ability) and hard skills (cognitive knowledge and professional skills). Similarly, Barak and Usher (2019), and Wu & Wu (2020) explain that Project-Based learning (PBL) is a prominent instructional approach in higher education that promotes meaningful learning opportunities and deep comprehension of theory as it allows active student engagement in the factual investigation of real-world problems or practices in small groups. Students tend to be more motivated to share ideas, provide feedback, engage in reflection and extend their knowledge when they work in small groups with their peers (Uziak, 2016).

The benefits of project-based learning (PBL) are boundless, and evidence suggests that PBL is beneficial for both students and lecturers (Thomas, 2010). PBL has the potential to improve student understanding of theoretical content and the development of critical 21<sup>st</sup>-century skills by engaging students in real-world problems within projects and activities (Han et al., 2015; Kokotsaki et al., 2016). PBL also takes students' various learning styles and learning preferences into account and provides students with the opportunity to discover who they are, as they experience increased independence, an enhanced attitude towards learning and feelings of commitment and ownership of the learning that takes place (Han et al., 2015; Thomas, 2010). According to Kuo et al. (2019) and Sasson et al. (2019), PBL projects also have the benefit of improving students' higher-order thinking skills and motivation to learn and engage with peers.

Various definitions exist to describe PBL in theory (Aksela & Haatainen, 2019). Han et al. (2015) define PBL as an interdisciplinary project or activity that is student centred with clearly defined outcomes. PBL is defined by Veselov et al. (2019) as the distinct, planned student activity or project that is limited in time and specifically aimed at solving a real-life problem that results in the development of a final product/artifact. The central notion of PBL is that real-world problems are provided in the form of a collaborative project or activity which captures the interest of students and motivates critical thinking as the students obtain and apply contextualised knowledge in a problem-solving setting, where the lecturer plays the role of facilitator and students develop social skills through experience (Indrawan et al., 2018). PBL is also defined by Blumenfeld et al. (1991) as an approach to teaching and learning that is unambiguously planned to engage students in the investigation of real-world problems and practices. PBL is therefore categorised as activities that are problem orientated, which means that the problem or question serves to drive the learning activity (Aksela & Haatainen, 2019). Similarly, PBL is defined as a well-structured pedagogical approach that motivates active student engagement and collaboration in the investigation of real-world problems (Sasson et al., 2018).



PBL is characterised as activities where students develop independence by conducting constructive investigations, setting clear goals within the project, collaborating and communicating with others and reflecting on the project that deals with real-world problems and practices (Kokatsaki et al., 2016). According to Aksela & Haatainen (2019), this is beneficial as PBL places students in contextualised, real-life problem-solving environments where they have the opportunity to debate, reflect on and extend their knowledge and revise their solutions or ideas that can serve to bridge the gap between theory and real-life experiences. In contrast to traditional learning methods, literature has indicated that students are empowered by PBL projects to become interactive role-players in the construction of knowledge through exploration (Indrawan et al., 2018). As a result, PBL is viewed as an effective educational approach that focuses on constructing new knowledge and skills by motivating students to think creatively and solve real-world problems whilst interacting with their peers (Indrawan et al., 2018). In order to create a successful PBL project, a shift needs to be made in the definition and expectation of the lecturer by breaking away from the traditional “lecturer and student model”, where the role of the lecturer involves collecting information, facilitating, and inspiring students to think critically and creatively in order to solve real-world problems and develop their skills (Pan et al., 2021; Prince & Felder, 2007).

Based on the above-mentioned, it is clear that the PBL strategy is grounded on the constructivist learning approach as students are expected to construct their own knowledge (Doppelt, 2003). This is further supported by Savery (2006), who states that PBL is consistent with a constructivist learning environment where students are expected to experience uncertainty and cognitive disequilibrium as students have the opportunity to choose how they want to approach the project in an independent manner.

Consequently, PBL projects have the potential to create exciting and meaningful learning experiences that add value to student learning due to the life-skills-oriented, competency-based learning nature of these projects (Indrawan et al., 2018). Additionally, it is becoming more and more important for higher education programmes to prepare students for a professional career outside the borders of their own country, culture, or language (Freeman et al., 2009). According to Brandon et al. (2021), intercultural learning supports students in obtaining skills that improve their employability and therefore, in the 21<sup>st</sup> century, the provision of an opportunity for intercultural learning is essential in higher education. The international classroom provides an excellent opportunity to educate interculturally competent professionals and leaders of the future (de Hei et al., 2020). Interestingly, international encounters can occur between people of different cultural backgrounds across national borders or even within the same country (Hofstede et al., 2010).

According to Darun et al. (2019), it is a trending and important practice for universities to conduct international collaborations in the form of student or lecturer mobility projects and exchanges, including joint research projects. Similarly, PBL may also involve establishing partnerships between universities or business schools in order to enhance innovation and improve social and global educational outcomes for students (Seow et al., 2019). As a result, the conducted PBL project included a strong international collaboration basis, where students were challenged to work in groups on the project and also transfer and receive the ideas to and from groups of students at other international partner universities.

## **International collaborative PBL project**

Design thinking has become a popular and widespread concept in education worldwide, gaining popularity due to the impact on and the development of student skills (Lim et al., 2020). As a result, especially for university students, it is becoming increasingly important within the employment landscape to anticipate and prepare students for future skill requirements (Lim et al., 2020; Shute & Becker, 2010). As a result, a design thinking PBL project was introduced with international collaboration that was focused on a real-life problem, with the aim to develop soft and hard skills, critical thinking and student motivation in a global context. With this in mind, the international collaboration PBL project was designed from a design thinking basis where students worked in teams and needed to collaborate with groups from other international universities in order to address a social cause (design challenge), based on the sustainable development goals to develop a solution that is practical, marketable, and sustainable (Lim et al., 2020).

The 24-hours international collaboration PBL project included students from North-West University in South Africa, Binus University in Indonesia, InHolland University of Applied Sciences in the Netherlands, and Durham University in Canada. All students were prepared to understand how to incorporate the design thinking process during this collaborative activity. The project challenged students to develop an online game, specifically designed to express the notion of internationalisation. The aim of the development of the online games was to provide the player with the opportunity to learn from other cultures and countries and to create cultural sensitivity and understanding during the time that the player is playing the online game. The students could develop any game that they could imagine, with the end goal to have a playable online demo game completed within a 24-hour cycle. Students were required to work in groups and transfer their ideas to the next group of students at the other participating universities.

The project was divided into three development phases, each with an 8-hour time limit. Participating universities had an equal number of student groups participating in the online game development, which resulted in seamless transfer of work at scheduled time slots. Indonesia and Canada had a total of 20 groups, South Africa had 13, and the Netherlands had 7. During the first 8-hour cycle, students from Indonesia were expected to start the ideation process. They needed to create concepts for online games with a theme of internalisation, globalisation or cultural diversity. At the end of their time 8-hour ideation process, a game development idea transfer took place to the student groups in the Netherlands and South African via Microsoft Teams. The transfer to these two countries took place at the same time as they share the same time zone. The South African student groups and the groups in the Netherlands continued with the design thinking cycle by choosing the best idea and developing it further into a working prototype of the online game. At the end of the second 8-hours cycle, the South African student groups and the Netherlands student groups transferred their ideas to the Canadian student groups via Microsoft Teams. The Canadian groups had the task to finalise, test, and refine the online game prototype and create a presentation video of the final product within the next 8-hour cycle. Once the project was complete, (24 hours later), a session was arranged via Microsoft Teams, where the student groups had the opportunity to see the final products and to reflect on the process.

## Research questions

The following research questions were identified from the international collaboration PBL project:

RQ1: What were the student expectations prior to the international PBL project?

RQ2: What were the expectations that lecturers had prior to the international PBL project?

RQ3: What were students' experiences with the international PBL project?

RQ4: What were the lecturers' experiences with the international PBL project?

## Research methodology

The purpose of the study was to address the research questions mentioned above through a reflection of student and lecturer experiences regarding the international collaborative PBL project. The research method used comprised of the qualitative approach, where data was collected by means of an online reflective questionnaire after the international PBL project was completed. The online reflective questionnaire comprised of open-ended questions that provided the participants with the opportunity to share their ideas anonymously. The data was further examined by employing the standards for evaluating observation objects and indications (Braun & Clarke, 2006).

## Data analysis

An inductive constant comparative analysis was used to define, appraise, and establish shared themes by participants. The inductive constant comparative analysis method is an iterative process of reducing the data through constant recording (Glaser & Strauss, 1967). This process commenced with open coding to develop categories after the first round of data reduction, followed by a further reduction to make it possible for core categories to emerge (Glaser & Strauss, 1967).

During the induction stage of the data analysis, each participant's answers were coded to avoid recurrence. This was done by means of the AtlasTi<sup>tm</sup> software programme. During this stage, the researchers considered both codes and categorisations and enabled the identification of themes from each of the participant responses to each of the research questions (Liu, 2016)

## Participants

The qualitative analysis included two groups of participants of which 43 were students and four were lecturers from four international universities across different time zones. The participating groups were from South Africa, the Netherlands, Indonesia and Canada, and had to work in teams to complete an artefact during a 24-hour cycle applying design thinking principles.

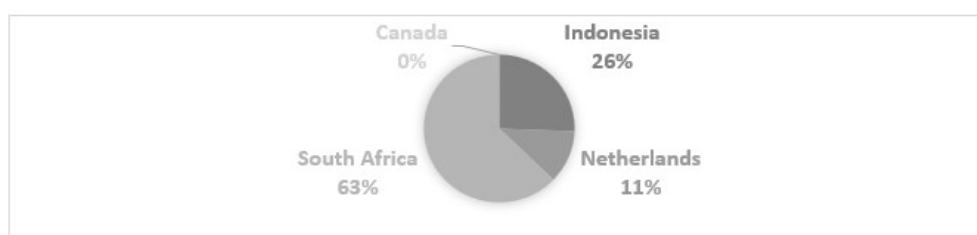


Figure 1: Student participants from the different countries.

As Figure 1 indicates, none of the Canadian students who participated in the project completed the online reflective questionnaire. The most participants comprised of South African students (63%), followed by Indonesian students (26%) and students from the Netherlands (11%).

Next, participants were asked to indicate whether they have ever worked with students from one of the other countries on any project-based learning project. The findings are presented in Figure 2.

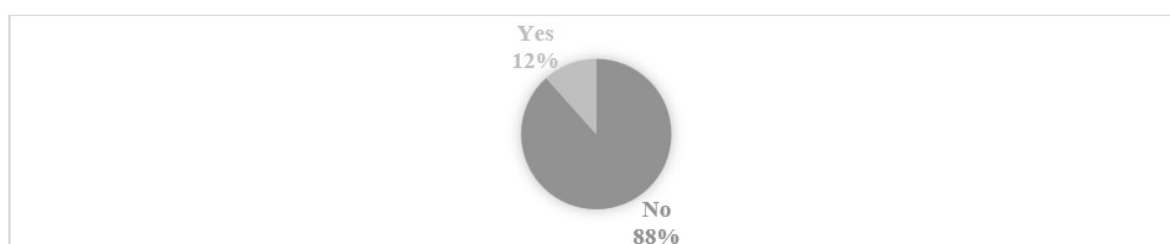


Figure 2: Experience in working with students of the other countries that participated in the international PBL project.

As indicated in Figure 2, most participants (88%) indicated that they have not worked with students from one of the other countries that participated in the international PBL project, while only 12% of the participants indicated that they have had the opportunity to work with students from the other countries that participated in the project.

As this study is aimed at providing a reflection of the student and lecturer experience with regard to the international PBL project, it is important to note that the 4 lecturers also completed the reflective online questionnaire.

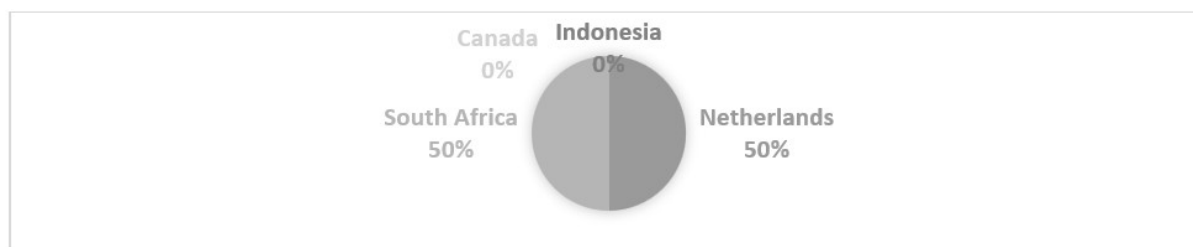


Figure 3: Lecturer participants from the different countries.

Of the four lecturers who participated in the reflective online questionnaire, only two lecturers from South Africa (50%), and two lecturers from the Netherlands (50%) participated in the study. Therefore, no reflection was received from the lecturers from Indonesia (0%), or Canada (0%).

Next, the lecturers were also asked to indicate whether they have ever worked with other lecturers from one of the other countries on any project-based learning project. The findings are presented in Figure 4.

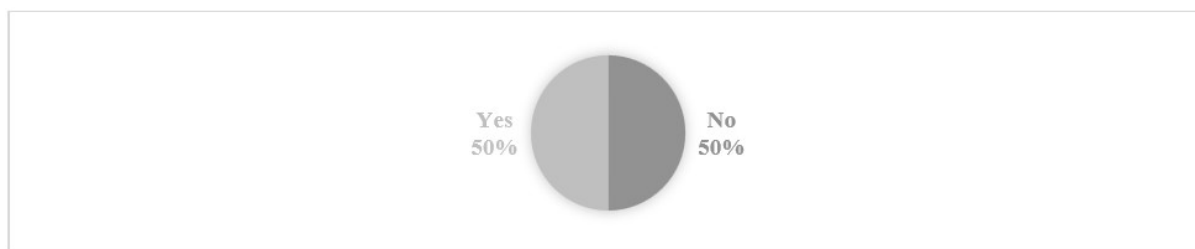


Figure 4: Experience in working with lecturers of the other countries that participated in the international PBL project.

As indicated in Figure 4, 50% of the lecturers have had the opportunity to work with other lecturers from the other countries that participated in the project, and 50% have not yet had the opportunity to work with other lecturers from other the other countries before this international PBL project.

## Findings and discussion

The findings and discussion are divided into two sections based on the specified research questions. The first section provides insight into the participants' expectations prior to the international PBL project, followed by a reflection on the student experience and lecturer experience. After each section, a short discussion of the findings is provided.

**RQ1: What were the expectations that students had prior to the international PBL project?**

The main expectations students had prior to the international PBL project are indicated in the Word cloud below.



Figure 5: Student expectations prior to the international PBL project.

As illustrated in Figure 5, the words that were associated with the international PBL project prior at the start of the project included words such as: interaction, collaboration, fun, intercultural, communication, team, opportunity, collaboration, and work. When comparing this to the expectations from the lecturers' word cloud, Figure 6, words such as unique, out of the box, one-of-a-kind, learning, opportunity, interesting, value, communication and experience are associated.

## RQ2: What were the expectations that lecturers had prior to the international PBL project?

The main expectations that lecturers had prior to the start of the international PBL project is indicated in the Word cloud below.



Figure 6: Lecturer expectations prior to the international PBL project.

## RQ3: What were students' experiences with the international PBL project?

As illustrated in Figure 7, the main positive experiences from the international PBL project were intercultural interaction and idea generation and development. The students enjoyed meeting and interacting with students from different countries and cultures, listening to how the other countries communicate, seeing how students across the globe handle situations and how ideas are interpreted by them. The students mostly enjoyed working with students from different countries and cultures. This is closely followed by idea generation and idea development, where students indicated that they enjoyed the creative part of the process, collaboratively generating new ideas, sharing the ideas with the different students and brainstorming with them to identify multiple solutions and possible scenarios, elaborating on the ideas, and creating unique solutions to the problem. They enjoyed developing a new online game, experiencing first hand how quickly and in-depth a concept can be developed within 24-hours, and seeing the idea come to life.

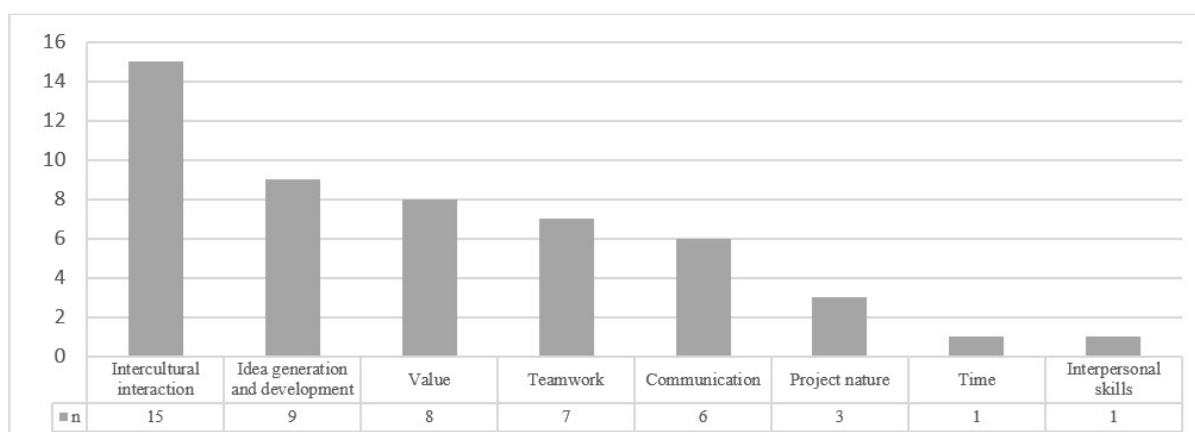


Figure 7: Positive student experience of the international PBL project.

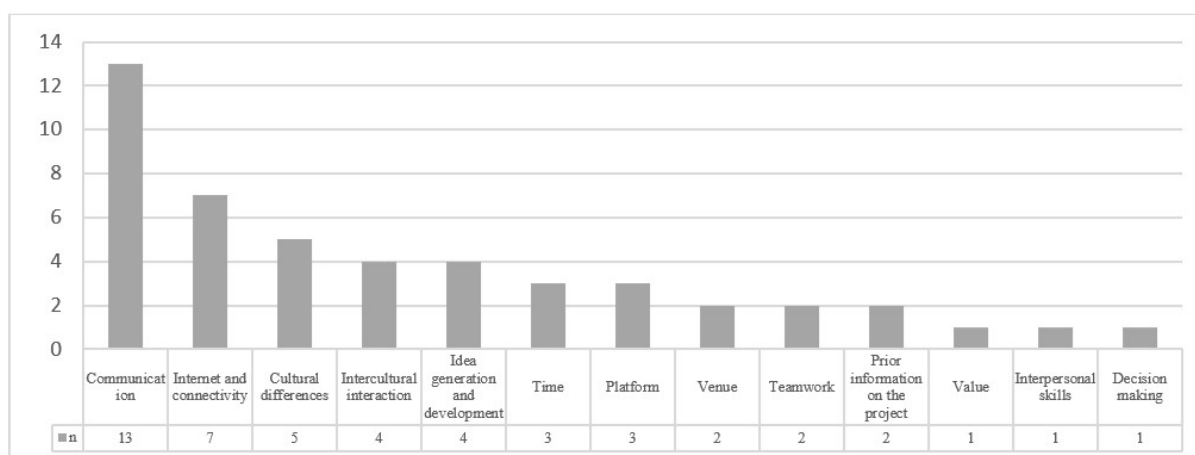


Figure 8: Challenging student experiences of the international PBL project.

From Figure 8, it is clear that students mostly struggled with communication, internet connectivity and cultural differences. The communication was challenging as they sometimes found it difficult to understand and communicate during the transfer of the game concept. It was also challenging to communicate and transfer the concept to the next group in another country. Communicating with complete strangers who speak with a different accent and vocabulary as well as poor internet connectivity seemed challenging and required staying patient and focus in explaining the idea and clearly articulating expectations and expectations to the student group in the next country. Not being able to communicate thoroughly and efficiently was frustrating. One of the biggest challenges was related to the lack of stable internet connectivity and students indicated that this resulted in not being able to reach students at the given transfer time, or that communication was hampered. The time of transfer in a time zone (afternoon for the groups in South Africa and the Netherlands), as well as language, pronunciation and cultural differences were reported to be challenging factors as well. Students felt tired when their eight-hour cycle concluded late afternoon or early evening. Table 1 outlines each of these findings in comparison to each other.

Table 1: Reflection of student experience with the international PBL project.

Positive experiences			
Theme	Code	N, %	Representative words, phrases, statements
Interaction with others	Communication	6, 13.95%	To communicate with different people with different backgrounds, communicate our idea, discussing and listening, explain the work and the expectations
	Teamwork	7, 16.28%	Working together as one team, working with students who are not around you, in different countries towards a common goal, working with my team.
	Intercultural interaction	15, 34.88%	Meeting and interacting with students from different countries and cultures, listening how the other countries communicate, to see how they handle situations, working with people around the world, see how the ideas are interpreted by them
Problem solving	Interpersonal skills	1, 2.32%	Motivating each other
Creativity of thinking	Idea generation and development	9, 20.93%	The creativity part of the process, coming up with new ideas together, sharing the ideas with the different students, and brainstorming with them to come up with multiple ideas, elaborating the idea, coming up with a unique solution to the problem, developing a new online game, to see how quickly and in-depth a concept can be developed within 24-hours, seeing the idea come to life

**Table 1: Reflection of student experience with the international PBL project (continued).**

Theme	Code	N, %	Representative words, phrases, statements
Project experience	Time	1, 2.32%	Complete the project in time
	Value	8, 18.6%	It was a really good experience, exciting, amazing, nice, enjoy, fun time, good stress to experience
	Project nature	3, 6.97%	The complexity of it all, something different than the usual task and group work, creative problem solving
<b>Negative experiences</b>			
Interaction with others	Communication	13, 30.23%	Difficulty in understanding and communicating the received idea from the first country, communicating, and transferring the idea to the next group (country), communicating with complete strangers, not hearing the other country during the handover, staying patient, and explaining the idea and what is expected to the next group, not being able to communicate thoroughly, inefficient commendation, hard time understanding
	Cultural differences	5, 11.62%	Time difference, being in different time zones, being tired at the time of transfer, difficulty understanding the Indonesian group, language differences
	Teamwork	2, 4.65%	Challenging working with group members not doing their part
	Intercultural interaction	4, 9.30%	The uncertainty, and not knowing what to expect from the other country, getting the information from the Indonesian group, challenging to manage time because of the different time zones.
Problem solving	Decision making	1, 2.32%	Making the decision, deciding on a game that everybody will know and enjoy
	Interpersonal skills	1, 2.32%	Difficult to make the Canadian students enthusiastic
Creativity of thinking	Idea generation and development	4, 9.3%	Creating the game, coming up with the rules for the game, picking the platform for the game was hard, deciding on which idea to use, difficulties in thinking about a fun game that would not be too complicated
Project experience	Time	3, 6.97%	The time was limited, more time would have been appreciated, time went by too fast, better timing than just a week, we did not have enough time
	Venue	2, 4.65%	The noise in the background from the main zoom channel, and students trying to get their ideas and info across, more privacy would have been appreciated
	Prior information on the project	2, 4.65%	Not knowing exactly what was expected of us, having very little knowledge about games
	Internet and connectivity	7, 16.27%	Connections to the other countries was poor, connection and communication wasn't good, frustrating communicating over a bad network on teams call, slow internet connection, internet connection was unstable and difficult to get hold of other participants, bad internet connection as it also affects the voice of someone who is talking
	Platform	3, 6.97%	Challenge with the communication channel, not clear, technical difficulties with the MS Teams meetings
	Value	1, 2.32%	Difficult to stay calm

Table 1 outlines the reflection of student experiences based on what they have enjoyed and what they considered to be challenging regarding the international PBL project. Some of the main themes that were highlighted included interaction with others, problem solving, the creativity of thinking and the project experience. It is also valuable to consider the project



experience from the lecturer's perspective. The following section will focus on the fourth research question, to explore the potential benefits and challenges the lecturers experienced during the international PBL project.

#### **RQ4: What were the lecturer's experiences with the international PBL project?**

As illustrated in Figure 9, the main positive experiences from the international PBL project for lecturers were: teamwork, value, intercultural interaction and idea generation and development. The lecturers mostly enjoyed experiencing the dynamics between the students and seeing the live moments, it was good to experience how students were working together in teams, and how students collaborated with each other. This is closely followed by value, where lecturers experienced the students having a great time designing and collaborating, and how the students embraced the project and the learning and experience that took place. Furthermore, lecturers indicated that they also enjoyed the intercultural interaction, experiencing the sessions between the students and international students, and seeing how their ideas were shared with each country. Lecturers also had a positive experience with idea generation and development by experiencing the students' creativity and how the teams thought about the concept and the final product.

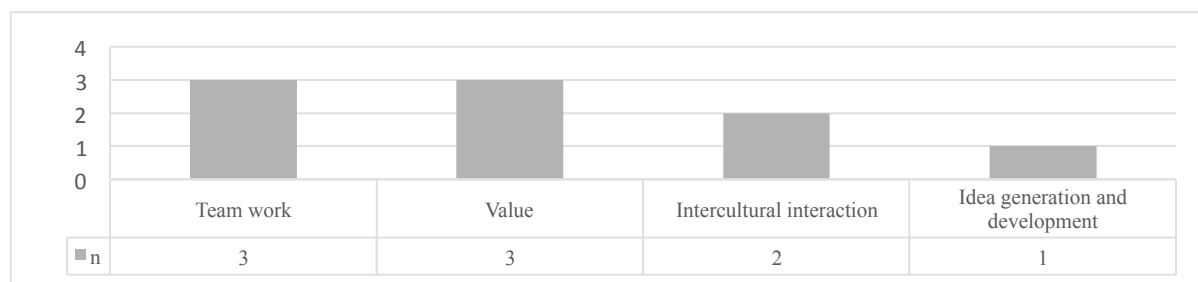


Figure 9: Positive lecturer experience of the international PBL project.

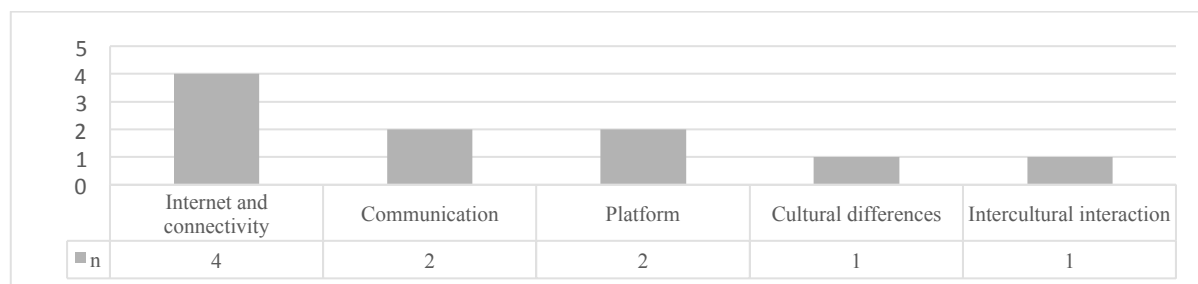


Figure 10: Challenging lecturer experiences of the international PBL project.

From Figure 10, it is evident that most lecturers agreed that the internet connectivity was a challenge, followed by communication, the platform used to communicate the transfer, cultural differences and intercultural interaction. In terms of the internet and connectivity, lecturers indicated that they experienced various technical issues. As a result, they spent a lot of time trying to establish stable connections, especially in South Africa. Furthermore, lecturers identified a lack of communication between the different country groups as another challenge. The Microsoft Teams platform used for communication and idea transfer was also a challenge, as lecturers struggled to get all the group members connected with the correct groups at the correct time. One lecturer also indicated that the cultural differences made the project more challenging, and another indicated that completing the game design was challenging as some student groups failed to connect with their international partner groups for the transfer of ideas.

Table 2 outlines each of these findings in comparison to each other.

**Table 2: Reflection of lecturer experience with the international PBL project.**

<b>Positive experiences</b>			
<b>Theme</b>	<b>Code</b>	<b>N, %</b>	<b><i>Representative words, phrases, statements</i></b>
Interaction with others	Teamwork	3, 75%	The dynamics between the students and experiencing the live moments, seeing how students were working together in teams, and how students collaborated
	Intercultural interaction	2, 50%	Experiencing the sessions between the students and international students, and seeing how their ideas was shared with each country
Creativity of thinking	Idea generation and development	1, 25%	Seeing the creativity and how the teams thought about the concept
Project experience	Value	3, 75%	Seeing the students have a great time, how the students embraced the project, witnessing the learning from the project and experience
<b>Negative experiences</b>			
<b>Theme</b>	<b>Code</b>	<b>N, %</b>	<b><i>Representative words, phrases, statements</i></b>
Interaction with others	Communication	2, 50%	Challenging communication, and lack of communication
	Cultural differences	1, 25%	Cultural differences made the project more challenging
	Intercultural interaction	1, 25%	Some international student groups did not show up for the transfer of ideas
Project experience	Internet and connectivity	4, 100%	Technical connections were not perfect, technical issues, spent a lot of time fixing things, the challenges in the South African context regarding connectivity
	Platform	2, 50%	Getting all the group members in the right meeting on the right time, problems with the MS Teams platform

Table 2 outlines the reflection of lecturer experiences based on what they have enjoyed and what they considered to be challenging regarding the international PBL project. Some of the main themes that were highlighted included interaction with others, creativity of thinking and the project experience.

Interestingly, when comparing the student experience to the lecturer experience, it can be noted that both students' and lecturers' positive experiences included interaction with others (teamwork and intercultural interaction), the creativity of thinking and idea generation and development, as well as the project experience (value). However, students differed from lecturers as they indicated that they also enjoyed communicating with the different students, solving the problem, and the project experience (time limit and project nature). In future, it is important to keep these positive experiences in mind, and to make sure that the next international PBL project focuses on meeting these needs. In contrast, the negative experiences when comparing the student and lecturer responses indicated that there was agreement regarding the challenges of interacting with others (teamwork, intercultural interaction, communication and cultural differences) as well as the project experience (internet and connectivity challenges, and the platform, Microsoft Teams, used to transfer ideas). However, students further indicated that they experienced challenges with regard to problem-solving and decision making, creativity of thinking (idea generation and development), as well as the project experience (time limit of the project, the venue, and the prior information about the project).

Most of the challenges and limitations experienced by both lecturers and students can definitely be managed to ensure the success of the next international PBL project. Most of

the students and lecturers were not familiar enough with the platform of delivery and experienced the inability to ensure stable internet connection. Both of these challenges are manageable and will ensure the future success of collaborative international projects.

## **Conclusions**

The benefits of PBL projects in higher education have been motivated in literature and include the development of critical thinking skills, improved motivation to take part in the learning process and increased student engagement to name a few (Kuo et al., 2019; Wu & Wu, 2020).

The above findings support theory on the development of several soft skills as students indicated that they were challenged to collaborate and work in teams in their own country as well as with the teams in other countries involved. They indicated improved soft skills as they were exposed to student groups from different cultures and countries across the globe and were challenged to communicate, solve problems and create new ideas collectively. The students also indicated that they enjoyed being part of the PBL project and that they found the project to be valuable.

This reflection provides us with the opportunity to aim to enhance these positive experiences for the next international PBL project, but also the opportunity to address the challenges, and to make sure that the challenges that can be managed including the venue, internet and connection, and the platform used is improved in order to provide increased value and learning opportunity. The importance of understanding different cultural contexts and the skills to collaborate in a global space needs enhancement.

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***The Motivation of Chinese Students in Learning Foreign Languages  
Other Than English***

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**Abstract**

This paper investigates the motivation of Chinese university students in learning Languages other than English (LOTES) through the lens of Self-determination Theory, exploring the difference in motivational types among different subjects of 75 university students who are English, LOTE and non-language majors who took part in the questionnaire-based study. Students' motivation was measured using Noels et al.'s (2000) Language Learning Orientation Scale-Intrinsic Motivation, Extrinsic Motivation and Amotivation Subscales (LLOS-IEA). Results show that overall Chinese students are more intrinsically motivated to learn LOTE out of personal development and satisfaction. This study also assessed whether students who learn different subjects differ in motivational types. The results of the between-groups ANOVA indicated that external regulation significantly differs among individual with different majors. Tukey's HSD post hoc analysis showed that individuals who are studying English or LOTEs are more likely to have feelings of obligation to study and have external pressured contingencies than those who are studying non-language subjects. Finally, this study also empirically validates the application of SDT in China.

**Keywords:** Foreign Language Other Than English Learning, Self-Determination Theory, Basic Psychological Needs

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## Introduction

In the view of both social and political contexts, the importance of learning foreign languages other than English (LOTEs) has been recognised and emphasised by the Chinese' s government, especially after the launch of the Road and Belt Initiative in 2013. For decades, motivation has played an important role in human behaviour; for instance, why people make their decision to do something --- 'the choice of a particular action', how long people will continue to do the activity --- 'the persistence with it' and how hard they will chase for it --- 'the effort expended on it' (Dörnyei & Ushioda, 2013, p.4). A number of empirical investigations were devoted to the motivation of learning English as a target language both in Anglophone and non-Anglophone contexts (see for example Boo et al., 2015; Clément, Gardner & Smythe, 1997; Lan, 2022). However, the research attention on the motivation of learning LOTEs in China has so far remained elusive. This project provides an important opportunity to advance cross-cultural understanding of the motivation of LOTE learning so that it would offer some useful advice to educators. In addition, this study will be one of the foremost works that employs SDT in LOTE learning in the Chinese context. It is hoped that these findings will have practical and theoretical implications for the broader area of second language acquisition in higher education, particularly in the understudied field of Chinese educational experiences. Firstly, the study aims to fill the research gap by examining the motivational orientations of university-level students in learning LOTEs from self dynamic perspective through the lens of Self-determined theory in China. Secondly, the study identifies the relationship between SDT orientations (external regulation, introjected regulation, identified regulation and intrinsic motivation) and basic psychological needs (autonomy, competence and relatedness). Three questions are specifically addressed: (1) What is the motivational orientation and how do learners differ in learning LOTEs across different subjects (English, LOTEs and non-language majors)? (2) How do learners differ in basic psychological need satisfaction and instrumentality in LOTE learning across different subjects (English, LOTEs and non-language majors)? (3) To what extent do basic psychological needs and instrumentality predict autonomous motivation?

## A Self- determination theory to motivation

The initial motivational theory in the second language is seen to be established by Robert Gardner (1959). Gardner's socio-educational model lays a substantial foundation for further developing motivational theories. The original categorization of motivation illustrates instrumental motivation and integrative motivation. Instrumentality is a salient driven force in Gardner and Lambert's (Gardner, 1985; Tremblay & Gardner, 1995; Dörnyei, 1990) influential conceptualization of L2 motivation besides 'integrativeness', reflecting the perceived pragmatic incentives and recognition that the usefulness of mastering a foreign language. The other key component is integrative motivation, reflecting the extent of being a part of their community in which the target language is spoken in order to master the language. There are two types of instrumentality on the basis of Higgins's (1998) distinction: promotion and prevention-focused. To be more specific, the former regulates personal goals and hopes in order to achieve positive outcomes to become successful and professional such as going abroad to study and getting a better-paid job. The latter regulates the duties and obligations in order to avoid negative outcomes such as passing an examination in order to graduate on time. However, it has been found that the same perceived instrumentality could be different depending on the context (Taguchi et al., 2009). For instance, it would be promotional for those who desire to go abroad to work or study to learn LOTEs while it also might be preventional for those who will be sent to work abroad by a corporation.



The original dichotomy of motivation named integrative and instrumental is not always mutually exclusive. This is the point made by Spolsky (1989); that some people feel motivated if they are integratively oriented or instrumental incentives while some might be driven by both. Previous studies have not identified a clear-cut factor for instrumentality (Gardner & MacIntyre, 1991) due to the lack of straightforward relevance of language learning to job desire and career aspiration for the younger generation (Dornyei, 1994; Dornyei & Csizer, 2002). A few empirical studies have connected 'instrumentality' to academic achievement (Rostami et al., 2011), self-regulation strategies (Tabachnick et al., 2008), motivational variables (Csizer & Lukacs, 2010), self-esteem (Streck et al., 2022), intended effort (Gao et al, 2022; Huang, 2019) and learners' choice to LOTEs (Chen et al., 2021).

Although the influential concept of 'integrativeness' or integrative motivation introduced by Gardner and Lambert (1959) was the center of L2 motivational research in the past almost 6 decades in the Anglophone context, it generated a heated discussion with regard to growing dissatisfaction with integrativeness. Dornyei (2006) points out that the definition of 'integrative' did not make much sense in terms of many language learning environments and the concept is comparatively limited. A growing number of studies have been conducted in China, Iran and Japan where people have limited opportunities to engage with communities which speak LOTEs. It might be challenging for them to generate the idea of integration with these communities. Therefore, it is essential to select the appropriate framework when measuring language learning motivation in the Chinese context.

### **Motivational orientation**

SDT is a robust theory for the explanation of human motivation along with the development of functioning of personality under a social context. In SDT, three general types of motivation reside along a continuum of self-determination with amotivation (lack of self-determined motivation) and intrinsic motivation (the most self-determined form) at the ends and extrinsic motivation (a more self-determined form) in the middle (Ryan & Deci, 2000; see Fig.1). Amotivation refers to the lack of intention and enthusiasm to act while intrinsic motivation refers to the feeling of enjoyment and satisfaction arising from engaging in an activity. Extrinsic motivation has been classified into four types of regulation on the basis of the degree of internalisation of self-concept, that is external regulation (stimulated by external reward or punishment contingencies), introjected regulation (stimulated by pressure or an external approval), identified regulation (stimulated by personal recognised value) and integrated regulation (stimulated by assimilated other values to the self). Integrated regulation has not been applied in the empirical research due to the similarity with identified regulation.

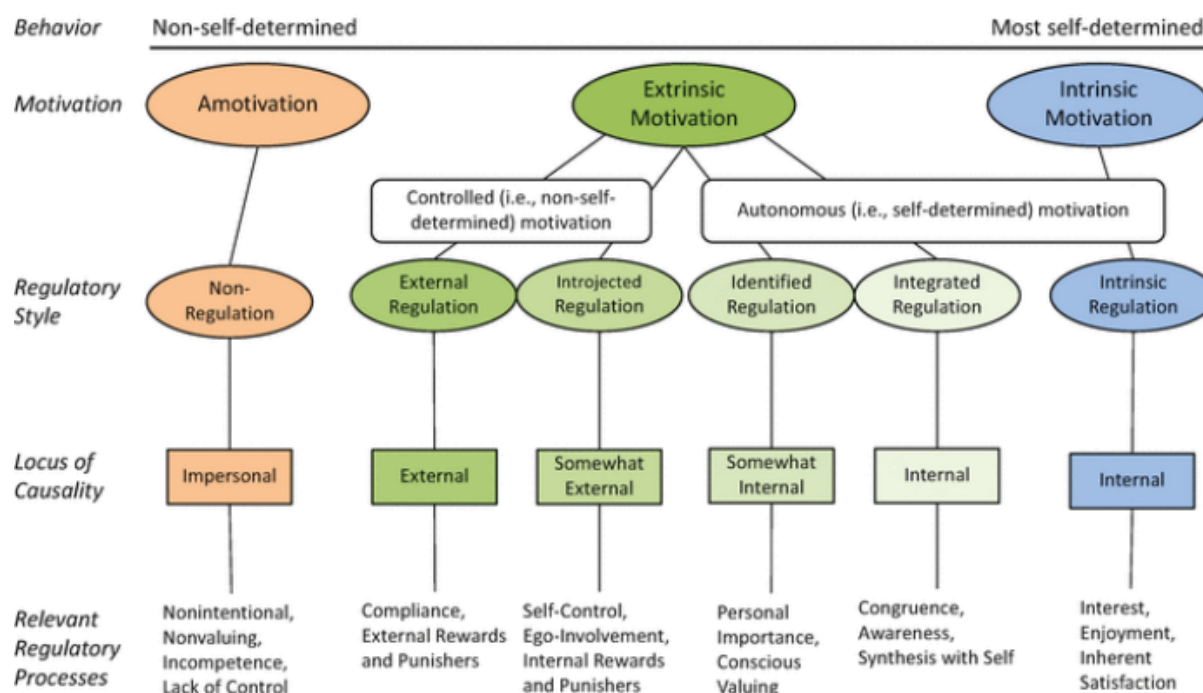


Fig 1. The self-determination continuum (Ryan & Deci, 2000, p. 72)

In previous studies, these regulations are grouped into autonomous and controlled motivation (Bureau et al., 2022; Liu, & Oga-Baldwin, 2022; Oga-Baldwin & Fryer, 2018). Autonomous motivation, in general, consists of identified, integrated and intrinsic motivation because these types of motivation all have a sense of volition that originates from a perceived locus of causality that is personal and internal. While controlled motivation is comprised of introjected and external regulation because they signify external demand arising from the external locus of causality (Deci & Ryan, 2000; Deci & Ryan, 2002). A previous study has evaluated the effectiveness of using specific orientations (the multidimensionality of external, introjected, identified and intrinsic motivations) and two general types of motivation (controlled and autonomous motivation) when in the progress of analysis (Howard et al., 2018; Alamer & Almulhim, 2021; Alamer & Lee, 2019). A number of recent studies support using two general types of motivation rather than four specific orientations by applying the bifactor exploratory structural equation modeling (ESEM) method (Alamer & Almulhim, 2021; Alamer & Lee, 2019; Howard et al., 2018). The results elucidate a better fit than the previous confirmatory factor analysis (CFA) models. Therefore, we will analyse the difference between two general types of motivation across subjects.

### Basic psychological needs

The Fundamental Psychological Need Theory (BPNT), one of the six mini-theories within Self-Determination Theory, has contributed to a significant resurgence in the research of basic psychological needs. SDT posits three basic psychological needs must be satisfied in order to sustain inherent interest, development and wellness (Ryan & Deci, 2017). The autonomous types of motivation will be dependent on the extent of three basic psychological needs satisfaction instead of operation by itself (Ryan & Deci, 2017). Intrinsic motivation may be undermined and good functioning becomes more challenging when those needs cannot be met (Ryan & Deci, 2017). Autonomy refers to free choice and volition in regulating activity. An autonomy-supportive approach is not only beneficial to intrinsic motivation but also promotes the maximum internalisation of extrinsic motivation (Deci,

Ryan & Williams, 1996). Competence is the feeling of mastery and effectiveness. Competence can be thwarted by non-constructive feedback and the continuous challenges can overload one's ability. As presented by a meta-analysis, the role of competence is essential in the development of language learning (Zhang & Zhou, 2019). It has been found in Japan that the strongest positive predictor of autonomous motivation and negative predictor of controlled motivation was the fulfillment of the competence demand, followed by autonomy and relatedness (Bureau et al., 2022). Relatedness is the feeling of social connection and interacts with significant others with a sense of belongingness, which is often associated with the external environment for instance teachers and classmates. Instead of a repeated emphasis on autonomy support in the learning environment, Ryan and Deci (2017) proposed that beyond autonomy and competence, relatedness has a strong impact on wellness and full functioning although more research is needed in this area.

### ***Basic psychological needs and motivational orientations***

The relationship between motivational orientation and basic psychological needs has been investigated over the past ten years. The majority of studies found that need satisfaction has a positive link with introjected, identified regulation and intrinsic motivation (Chen, 2014; Gourlan et al., 2013; Ullrich-French & Cox, 2014). As Chen (2014) demonstrated, three basic psychological needs negatively impacted on external regulation and amotivation among elementary students in physical education. These studies mainly have been conducted in physical education among elementary students. It has been confirmed the speculation originating from Gardner (1985, p.6) that language motivation is distinct from other school subjects (Oga-Baldwin & Fryer, 2020). It is unknown whether these associations can be observed in a language learning settings.

### **Foreign language education in China**

The paramount importance of English in the education system around the nation has been long-established, evident by the fast expansion of privately owned language schools and private tutoring over the years (Bolton & Graddol, 2012; Yung, 2015; Yung & Yuan, 2020). There are nearly 1.75 billion English speakers around the globe, accounting for a quarter of the world's population (British Council, 2013). 400 million people in China speak English with varying levels of ability (Wang, 2015). Unexpectedly, for the reduction of both homework burdens and after-school training known as 'dual alleviation', the Chinese Ministry of Education announced the policy 'Law on the Promotion of Private Education', which banned for-profit after-class tutoring for primary and secondary students in 2021 (MoE, 2021). Thereby, the number of English training institutions have been cracked down after the rules. However, LOTEs teaching institutions are not the case. The people who are learning LOTE are adult learners. By the launch of the 'the Road and Belt Initiative' in 2013 (referring to the Silk Road Economic Belt), the Ministry of Education (MOE) has become conscious of the importance of speaking LOTE and has been much more active in facilitating the teaching and learning LOTE in Chinese universities (Zhang, 2019; Chen, Zhao & Tao, 2020). The Chinese government has been encouraging students to learn LOTEs by investing in non-English foreign language education and expanding LOTE learning programs and courses in eight Chinese universities (Han, Gao & Xia, 2019). For instance, the number of universities that supply non-English foreign languages degree programs has increased from 33 to 98 by the end of 2000 and 2017, respectively (Shen, 2019; Han, Gao & Xia, 2019). The most recent reform announced that three more foreign languages, namely French, German, and Spanish, should be added to the National Matriculation Foreign Language Test alongside

English, Russian and Japanese (MoE, 2018). This demonstrates the aspiration of the government to extend LOTE learning from tertiary to secondary-school education.

Facing such a rapid development of non-English foreign language programs in Chinese mainland universities, it is imperative to examine university students' motivation of learning a second foreign language other than English and how their goals influence their motivation. LOTE learning has started to draw researchers' attention in China in recent years. Taking an example of learning Japanese in China, there is a growing number of studies that revealed factors that contribute to the motivation of learning Japanese. Intercultural orientation, Japan-related products and employment opportunities are principal determining factors of learning Japanese even under exposure to Japan-related affairs in the media coverage (Lv, Gao & Teo, 2017; Gao & Lv, 2018). Humphrey and Miyazoe-Wong (2007) found that the interest in Japan's unique culture (e.g., manga, samurai, anime and sadou) is becoming one of the significant reasons for learners to choose Japanese and feel motivated in Hong Kong, which echoes the findings of Northwood and Thomson's paper in 2012 that confirm Australian learners of Japanese are attracted by Manga and other Japanese popular cultural products. A further elaboration of cultural interest is given by Wang and Zheng in 2019 that Chinese people appreciate Japanese tea and calligraphy culture rather than marriage and corporate culture, which share some similarities with Chinese social culture that discourages citizens in social pressure and welfare system. Those scholars' work on motivational factors is complemented by Teo et al.'s (2019) study which shows that Chinese Japanese learners' desire for cross-cultural communication is undermined by increased media exposure to Japan-related issues, which instead promotes the approach to engaging with Japanese people (Teo, Hoi, Gao & Lv, 2019). This finding indicates that enough affordances could sustain the motivation in LOTE learning in non-LOTE speakers' contexts. To better understand the role of affordances in motivation study, Lu, He and Shen (2020) identified the resources that are applicable to LOTE learning and the perceived benefits, that is the benefits obtained from the economy, culture and society, are two prominent determinants of being motivated or demotivated learning LOTE among Chinese university students.

The motivation for learning Asian or European foreign languages in China might be driven by different reasons. Empirical research has elucidated that learners tend to have integrative motivation (because of their culture and people) for learning Asian languages (Lv et al., 2017; Humphrey & Miyazoe-Wong, 2007), represented by Japanese, whereas learners either have instrumental motivation (labour market and institutional constraints) or the desire to develop multilingual self (Zheng et al., 2020) for learning European languages, represented by Spanish ((Lv et al., 2017; Lu et al., 2019; Querol, 2014).

It is often seen that participants at a university level are chosen in all LOTE studies in China. Most of them are studying a LOTE major, with those who are studying English or non-language major rarely scrutinized. For instance, a minority of studies have examined the intertwined relationship between English and LOTE among Chinese English major students (Liu & Oga-Baldwin, 2022). Here it is worth explaining that it is compulsory for English major students to select a second foreign language, is expected to graduate with a certain proficiency level in both English and LOTE in China (Han, Gao & Xia, 2019). That is the reason why English major students were chosen for this study, however, we will not look into the details of the English intervention with LOTE.

## Methodology and method

### 1. Participants

A total of 75 students ( $n_{\text{male}}=20$ ,  $n_{\text{female}}=55$ ) at ordinary universities (non-double first-Class universities) in Southern China were included in this pilot study. Ages ranged from 18 to 55 years old ( $Mean=24.7$ ,  $SD=5.27$ ). Participants were voluntarily recruited through a random sampling technique on the Chinese social platform called Redbook. All participants were L1 Chinese learners, who were learning foreign languages other than English at the time of study grouped by English ( $n=17$ ), LOTE ( $n=30$ ) and non-language major ( $n=28$ ). Participants were required to choose the most used foreign language other than English if they simultaneously learned more than one LOTE. Around 88% of students were learning the most common LOTEs in China (Japanese, Korean, Russian, German, French and Spanish) and nearly half of the respondents (45.3%) reported no exposure to the country where they were learning LOTEs. More than one third (37.3%) of respondents have been learning LOTEs for over four years.

### 2. Procedure

Data used in this study as the pilot study data of a large-scale project, which compared the effectiveness of Self-determination Theory and Second Language Motivational Self System in measuring Chinese university students' motivation in LOTEs learning, which is not the focus of this paper. The questionnaire was administrated to individuals who were willing to complete it via the Qualtrics platform. All the participants were approached and informed consent was obtained individually before they started the survey. Ethics approval was obtained and the official permission to conduct the study was granted by Bishop Grosseteste University.

### 3. Measures

The questionnaire consisted of two sections. The first section inquired about participants' background information and the second section contains 10 subscales measuring five SDT subtypes for learning LOTEs, three basic psychological needs and two goal-related scales. Each subscale was rated from 1, strongly disagree to 6, strongly agree on a Likert scale. The questionnaire was translated into Chinese and back-translated by Google translation and three people who are studying translation in Master's degree with TEM-8 certification (Test for English Majors Brand 8), regarded as the hardest test for English majors in China (Li et al, 2007, p.78). The questionnaire has been edited into a new version so as to make the language easier for participants to understand. All negative items were recoded before data analysis.

#### 3.1 Questionnaire 1: Language learning motivation

The language learning scale was adapted from Noels et al's (2000) questionnaire in order to measure the four constructs within SDT (i.e., 3 items amotivation, 3 items external regulation, 3 items introjected regulation, 2 items identified regulation and 2 items intrinsic motivation). Integrated regulation usually will not be analysed in the empirical study due to the difficult classification of intrinsic motivation (Noels et al., 2000).

### **3.2 Questionnaire 2: Basic psychological needs**

The basic psychological needs scale was adapted from Carreira's (2012) and Hiromori's (2006) questionnaire that has been applied in the Japanese context in order to assess how much participants felt their needs were satisfied. The questionnaire contained 12 items with three scales, namely 4 items perceived autonomy (e.g., 'I am willing to participate in LOTE lessons. '), 4 items perceived competence (e.g., 'I am capable of performing well if I study LOTE hard. ') and 4 items perceived relatedness (e.g., 'Everybody in the class enjoys LOTE lessons. ').

### **3.3 Questionnaire 3: Instrumentality promotion and prevention**

Promotion-focused and prevention-focused instrumentality scales were modified from Taguchi, Magid and Papi's (2009) questionnaire in order to explore the ideal image of professional success and regulation of duties and obligations for learning LOTE. Three items assessed participants' promotion-focused instrumentality, such as learning LOTE to find a highly paid job or earn good wages, while 3 items measured participants' prevention-focused instrumentality, for instance learning LOTE to avoid getting bad marks in the examination.

## **4. Data Analysis**

The data obtained from the online questionnaire was analysed with SPSS 27. Three major approaches were used to examine the data: (1) Descriptive analysis (2) A one-way Analysis of Variance (ANOVA) to test the difference in motivational orientation, basic psychological needs and instrumentality among English, LOTE and non-language majors. (3). Regression Analysis to identify the relationship within variables and to identify the predictors.

## **Findings**

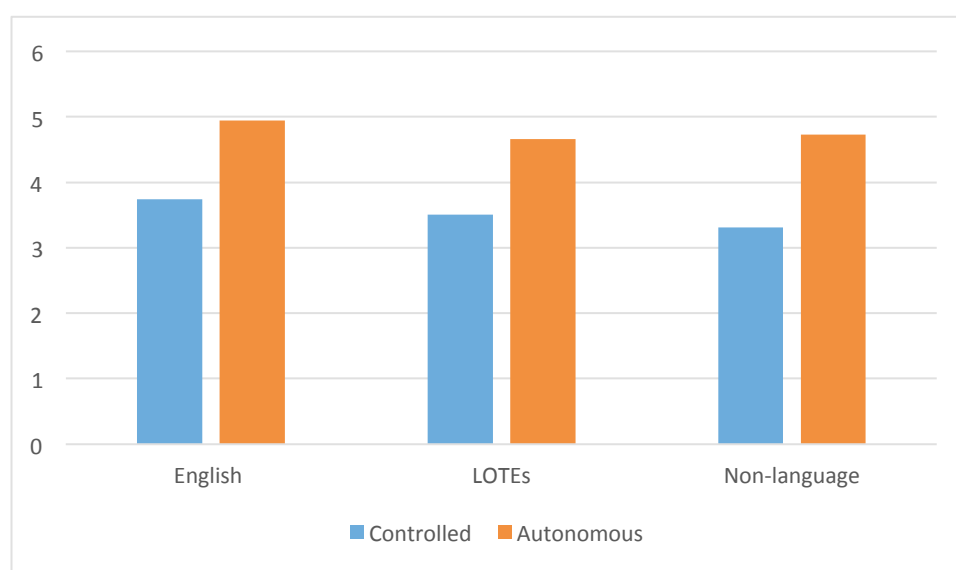
### **RQ1: Motivational orientation across subjects**

The results of RQ1 are presented in Table 1. It can be seen that Chinese university-level students studied a foreign language other than English mainly because of identified regulation (personal development, personal choice), followed by intrinsic motivation (the pleasure of understanding the targeted language and the satisfaction of accomplishing difficult challenges). This result echoes the findings of Lv et al's paper in 2017 that university students are interested the culture and society where the target language is spoken. However, this finding conflicted with a previous study carried out by Al-Nahdi and Zhao in 2022, which found that Chinese university students are more instrumental than integrative in their motivations to study Arabic. One of the possible reasons is that this research has not classified different types of a foreign language other than English, for instance Asian and European foreign languages. Further studies are needed in this direction to help us ascertain the motivating role played by different types of foreign languages other than English.

Regulation	Mean	Std. Deviation
External	3.14	1.05
Introjected	3.84	.69
Identified	4.80	1.05
Intrinsic	4.69	.885

**Table 1** Descriptive statistics (N=75)

The first research question not only investigated the common motivational orientations among university-level students but also identified how motivational orientations are different across three majors. In order to test the difference in motivational orientations across the subjects, it was hypothesised that LOTE, English and non-language major would impact varying forms of motivational regulations (autonomous and controlled motivation). To test this hypothesis, a one-way independent-samples analysis of variance (ANOVA) was conducted. Results indicated there was a significant difference in the controlled motivation,  $F(2,72)=3.79$ ,  $p < 0.05$ , across different majors while non-significant effect happens in autonomous motivation ( $p > 0.5$ ). Post hoc Tukey comparisons demonstrated significantly higher controlled motivation in English ( $M=3.75$ ,  $SD=0.38$ ) compared to non-language majors ( $M=3.31$ ,  $SD=0.65$ ;  $p=0.02$ ). Students who study English are expected to have more controlled motivation than non-language majors because they have the obligation and more external pressure in the face of passing the exam and graduation. However, what is quite interesting is that there is not a significant difference between LOTE and non-language majors, although those who study LOTE and English are required to pass a second foreign language test in order to successfully graduate. One of the possible reason for that is because those who study LOTE have spent more time on LOTE learning than those who study English, which leads to external pressure which has been internalised to some extent. Those who study LOTE have generated a LOTE-related self-image in their future career and devote themselves to engaging in LOTE, while those who study English major probably have more flexible choices in terms of career chosen.



**Figure 2:** Two types of motivation across different subjects

## RQ2: Difference in basic psychological needs and instrumentality across subjects

One objective of the present study was to determine how learners differed in three basic needs and instrumentality across subjects. The hypothesis was that there was a significant difference in basic psychological needs across different subjects. The main ANOVA effect demonstrates a significant effect of subjects on competence ( $F(2,72)=3.32$ ,  $p<0.05$ ). Pairwise comparisons of the means of using Tukey HSD revealed significant differences between LOTE and non-language majors ( $p<0.05$ ). More specifically, the competence scores of LOTE major students ( $M=3.7$ ,  $SD=0.42$ ) were significantly higher than non-language major students ( $M=3.42$ ,  $SD=0.41$ ). There were no other significant differences in competence found between English and non-language major ( $p>0.05$ ) and no other significant differences in autonomy and relatedness across three majors as well.

An additional hypothesis was that there would be a significant difference across the three subjects in terms of instrumentality. The ANOVA indicates that instrumentality promotion-focused scores of the groups differ significantly ( $F(2, 72)=3.3$ ,  $p=0.04$ ). Pairwise comparisons of the means of using Tukey HSD revealed significant differences between English and non-language, and LOTE and non-language as well. English and LOTE major students ( $M=4.09$ ,  $SD=1.05$ ;  $M=3.98$ ,  $SD=1.18$ ) have stronger instrumentality promotion-focused in LOTE learning compared to non-language major students ( $M=3.25$ ,  $SD=1.46$ ). No significant difference is found in instrumentality prevention-focused across three subjects ( $p>0.5$ ).

## RQ3: Interaction among basic psychological needs, instrumentality and autonomous motivation

variables	competence	relatedness	autonomy	INSP	INSV
competence	1				
relatedness	.204	1			
autonomy	.245*	-.057	1		
INSP	-.109	-.123	-.022	1	
INSV	.001	.255*	.012	.232*	1

**Table 2:** Matrix of Correlations

Note:

INSP=Instrumentality promotion-focused; INSV=Instrumentality prevention-focused.

The correlation between variables were presented in Table 2. Regression analyses were conducted to determine if basic psychological needs and instrumentality could predict autonomous motivation. It was hypothesised that autonomous motivation can be positively predicted by basic psychological needs and negatively predicted by instrumentality. Analyses show that 19.9% ( $R^2=20\%$ ) of the variance in autonomous motivation can be accounted for by the five predictors (relatedness, competence, autonomy, instrumentality-promotion focused and prevention-focused) collectively,  $F(5, 69)=3.42$ ,  $p<0.05$ . Looking at the unique individual contributions of the predictors, the results indicate that instrumentality promotion-focused ( $\beta=0.3$ ,  $t=2.67$ ,  $p=0.01$ ) positively predicts autonomous motivation. This result is consistent with the previous finding that although the learners don't have a clear picture of the utilization of learning German, in other words, they neither have any explicit plan for studying abroad nor a definite strategy for their future career, the participants pay attention to personal advancement (Chen et al., 2021), which verify that instrumentality



promotion focus is a motivating factor in LOTE learning. It also suggests that the three basic psychological needs did not play a role in the prediction of autonomous motivation, which is contradicted by other studies that show a positive relationship between three basic needs and autonomous motivation (Noels, 2001; Oga-Baldwin et al, 2017). However, the previous finding was concluded in the English learning context, it might be slightly different in LOTE learning context due to enough autonomy perceived by university students. What is more, autonomy shows a negative relationship with autonomous motivation. We assume that it might be a culture issue that the research is based in China where there is social connectedness and respect for authority (Ho & Crookall, 1995; Riley, 1988). This study was consistent with Ntoumanis (2001)'s findings that perceived autonomy did not predict autonomous motivation among secondary school students in Britain. Keeping strengthening the importance of autonomy, in this case, might be not an appropriate way to promote their autonomous motivation.

## Conclusion

The present study not only unveils the motivational orientation of LOTE learners but also explores the difference in basic psychological need satisfaction and instrumentality within the subjects (English, LOTE and non-language majors) at a Southern Chinese university. Drawing on Self-determination theory (SDT), we explored their motivations from the degree of their self-internalisation. Based on questionnaire results, the study revealed that participants are more likely autonomously motivated to master LOTE across three majors. To be more specific, personal advancement and satisfaction are the main driving forces to keep them going. It is essential for language educators to help LOTE learners build up their self image for the future by involving in some job-related information, overseas study and living experiences and the culture of the target language. Thereby, one method to explore in a future study might be to use Dornyei's L2MSS. In addition, it has been discovered that learners who study LOTE will feel more competency than those who study non-language majors. Although three basic psychological needs have been highly satisfied, no relationship has been found between basic needs and motivational orientations. Besides, English and LOTE major students have stronger instrumentality promotion-focused in LOTE learning compared to non-language major students. While instrumental promotion oriented is a strong motivator for LOTE learners. Our findings demonstrate the utility of the self-determination theory perspective in the context of China to produce a more precise understanding of learning a foreign language other than English motivation

However, there are some limitations in the current study should be noted. First, this is pilot study data. The limited sample size is not large enough to represent all Chinese university students' motivation. Second, the study is limited by the investigation of the needs satisfaction among LOTE learners, it would be fruitful to further explore how their learning experience has an influence in their basic needs from the meso level, for instance, teaching style of teachers. Third, in order to better understand the motivational factors of LOTE learners, more research is needed by adding various motivational factors both from a micro and macro perspectives. As consistent policy reform toward LOTE learning provided more foreign language options to secondary school students, further research may also shed light on motivation change over the time from pre-tertiary to tertiary students in LOTE learning by carrying out a longitudinal study.

## **Acknowledgement**

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## Appendices

### Questionnaire

#### Part 1: Why are you learning a LOTE?

Tick which box best describes how much you agree or disagree with the following statements:

Strongly disagree, disagree, slightly disagree, slightly agree, agree, strongly agree.

1. For the pleasure I get from being able to understand what LOTE speakers are saying.
2. In order to earn good wages in the future.
3. Because I would feel guilty if I didn't know LOTE.
4. I don't know why I am studying LOTE.
5. In order to get a good job in the future.
6. For the satisfaction I feel when I am in the process of accomplishing difficult exercises in LOTE.
7. Because I would feel ashamed if I couldn't speak to my friends from LOTE -speaking countries in LOTE.
8. I think I am wasting my time learning LOTE.
9. Because I think it is good for my personal development.
10. Because it is expected of me.
11. Because I choose to be the kind of person who can speak LOTE.
12. I don't care about studying LOTE.
13. To show that I am a good citizen because I can speak LOTE.
14. Because I would like to spend a longer period living abroad (eg. Studying and working).
15. Because I don't want to get bad marks in my exams.
16. Because I am planning to study abroad
17. In order to attain a higher social respect
18. Becau  
se I don't like to be considered a poorly educated person.

#### Part 2: Psychological needs

Tick which box best describes how much you agree or disagree with the following statements:

Strongly disagree, disagree, slightly disagree, slightly agree, agree, strongly agree.

1. I voluntarily speak during LOTE lessons.
2. I consider myself good at LOTE
3. I learn cooperatively with classmates during LOTE lessons.
4. I am not willing to participate in LOTE lessons (reversed)
5. I enjoy studying with teachers and classmates during LOTE lessons
6. LOTE lessons are well-organized and structured.
7. I don't voluntarily participate in LOTE lessons (reversed).
8. I am capable of performing well if I study LOTE hard.
9. I fully understand what I have been taught in LOTE lessons.
10. Everybody in the class enjoys LOTE lessons.
11. I often consider myself bad at LOTE (reversed).
12. I am willing to participate in LOTE lessons.

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***Exploring the Challenges of Academic Fatigue and Strategies to Enhance Retention for the Determined Ones (TDOs) in Online Learning***

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**Abstract**

The daily activities of educational institutions globally were affected by the Covid-19 Pandemic in 2020. The abrupt transition from on-campus to distance learning gave students and educators limited time to prepare for such a massive shift in teaching and learning. Students with disabilities (dubbed TDO students in the UAE), were negatively impacted because their normal routines had been abandoned, leading to anxiety and stress. This study adopted a qualitative approach to explore effective strategies for online learning, to engage TDO students, implement a support program to meet their needs and enhance online learning experiences whilst reducing fatigue and improving retention. Research tools included semi-structured interviews, observations and document analysis. Five themes were derived from the findings, including a lack of training for students and staff, standardization of TDO identification procedures, limited use of online tools and time factor. Data collected revealed challenges of academic fatigue and retention for TDO students. Strategies for positive impact was an increase in the use of technology tools that facilitated high student engagement, e.g. Nearpod, Padlet, Kahoot, Quizzies, in online settings. A reduction in the length of classes led to improved retention figures. Recommendations from the study included the creation of a TDO Support Hub, increase the use of assistive learning technology tools, such as, audio books, desktop magnifying screen, supernova software as critical factors. Also, offering a more personalized curriculum to TDO students, in conjunction with providing continuous opportunities for staff to be trained in online teaching approaches made a difference.

Keywords: Academic Fatigue, Retention, Assistive Technology, Online Learning

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## Introduction

The original publication for this study (Lottin, J, 2021) described a summer project that was initiated to get some answers, following the challenges of academic fatigue and increasing student drop out from courses when the pandemic struck.

Governments worldwide, including in the United Arab Emirates (UAE), were keen to contain the spread of the coronavirus. Educational institutions across the UAE, guided by the UAE Government federal mandate and Ministry of Health directives, moved from face to face classroom instruction to an online distance learning platform dubbed "Learn from Afar" (Juman, 2020), in order to keep the citizens safe. All educators had to change their teaching approaches by using high quality engagement strategies and methodologies needed to maintain high-quality teaching for students learning through an online medium or platform.

Consequently, HCT students moved to online learning in response to the Covid-19 pandemic, implemented out of necessity for reasons of health and safety. Through this pilot study, system wide surveys were sent to students to establish how they were coping with their studies. Feedback received depicted a trend that students were facing lots of challenges staying focused online for the two hours' duration of lessons. Also, issues of online academic fatigue and retention on programs became apparent. TDO students were highlighted as particularly affected by the transition and struggling in virtually all their courses. An analysis of the survey questions revealed results of inconsistent routines for them, unknown plans, staff not trained on alternative online learning and assessment strategies, lack of home support for students using an online mode of delivery, soft skill components missing from the online approach, and students questioning faculty competency in using the technology. An advisory committee was created to discuss the impact of the transfer of delivery to a fully online model, and what strategies could be explored to support and address online academic fatigue and retention. Hence, following the data collected and analyzed, HCT leadership decided to address these issues through a call for a pilot project, to implement quick-win strategies to remedy the two key issues of academic fatigue and retention. This research project would focus primarily on implementing an academic support program of strategies to rectify any barriers and challenges that TDO students were facing with online learning. Other recommendations included training staff to deliver classes using effective, proven online strategies and for practical solutions that would enhance student retention.

A research motivation was also to provide equitable learning opportunities to TDO students that would empower them with the knowledge and skills to be valuable and active contributors to the UAE society and economy. This paper focuses on:

- Exploring effective strategies to improve learning for The Determined Ones (TDOs), in the delivery of online lessons.
- Investigate the impact of using technology tools that facilitated high student engagement for a positive impact in online learning.
- Analyze assessment data for TDO students' success rate, when the use of adaptations such as accommodations and modifications to assessments are in place.
- Investigate how HCT can improve academic fatigue and retention for TDO students through the creation of an Academic Support Hub.

## Purpose of the Study

The purpose of this qualitative research study was to determine the strategies that were effective in supporting the needs of TDO students in online learning, and implement the use of technology tools such as Nearpod, Padlet, Kahoot, WebQuest, Quizzies, and discussion boards to engage students more. Also to reinforce the use of the new online strategies, a dedicated TDO Hub would be created to meet their needs. The aims of the study focused on implementing the approaches and strategies in class in order to enhance the online learning experience for students across HCT. The support program in the TDO Hub included developing a system that intersperses multimedia content and learning materials with regular short activities and assessments that improved student engagement, provided more collaborative learning opportunities, more asynchronous learning opportunities, break up lectures, gamification and direct student support. The program implementation was monitored, its effectiveness evaluated through a survey and focus group sessions with participants before, during and after lessons. Furthermore, the use of assessments within an online learning and teaching environment were reviewed to ensure that it had a positive impact on students' progress. The TDO support program provided a rich and contextualized view of how various stakeholders, including faculty instructors, counselors and students, perceived the implementation of online learning, especially as it pertained to TDO students.

In recognition of the UAE Government 2019 Strategy of 'No Emirati Left Behind', this research study fully aligned to the vision of the country's leaders that guaranteed equity for all its citizens. It was essential that HCT identified and removed any barriers to successful online learning for TDO students, thus eliminating any educational disadvantage they would encounter. The transfer to online learning had resulted in students having up to 6 hours' minimum a day of online learning, mostly with traditional back-to-back lessons, in addition to extra hours required for reading, doing research, completing homework and other assignments on their programs.

## Research Design and Methodology

This pilot study adopted a qualitative approach using multiple data collections tools, including semi-structured interviews using a questionnaire to participants, some analysis of relevant documents, and student observations during class time. These three tools would address the five research questions namely:

### Research Questions (RQs)

- 1) What are TDO students' experiences with online learning?
- 2) What was the impact to students' academic fatigue levels with the transfer to online teaching and learning?
- 3) What innovative strategies using online technology tools could improve students' outcomes to ensure higher retention rates?
- 4) What was the structure of the academic support program to reduce TDOs academic fatigue in online learning?
- 5) How could HCT improve the learning of TDO students using an online delivery mode?

While quantitative research emphasizes the measurement of specific variables and the extraction of particular data relevant to the research topic, qualitative research, on the other

hand, aims to examine specific behavioral patterns by analyzing the attitudes, beliefs, and intentions of the target population and forming a suitable explanation based on the gathered observations (Draper, 2004).

The use of semi structured interviews had been gaining popularity in recent research given their importance in shedding light on the different perspectives between several groups of people regarding the topic of interest. Additionally, interviews would generate a large pool of data in a relatively short period of time, and the results would be illustrated in a reader-friendly way by demonstrating specific quotations used by the participants (Rabiee, 2004). Furthermore, interviews had also been known for their ability to provide reliable explanations for people's behaviors and actions, especially since the target population was specifically chosen based on its expertise in the topic at hand (Heary and Hennessy, 2002). For instance, in this research, the target population was selected based on their ability to provide relevant and insightful information which helped the researcher adequately address the five research questions. Furthermore, the topic of this research demanded a more personalized approach for data collection where the methods used provided subjective and valuable information from the participants. It allowed participants to express their perceptions and beliefs openly. It was important for the TDO students' voice to be heard. Hence, using a relatively small sample size in the pilot study enhanced the researcher's attentiveness to specific details and observations, all of which would most likely be ignored when adopting a quantitative approach to research.

Research questions 1 and 2 were addressed using semi-structured interview questions in the form of a questionnaire, consisting of a total of 24 open-ended questions, categorized as follows:

- Ten questions targeted at students through one-on-one interviews. The aim was to grasp a clear view of the experience of TDO students exposed to an online learning environment, and its impact on their fatigue levels.
- Eight questions were addressed at instructors during interviews and the aim was to explore the instructors' use of online engaging techniques and any related modifications that catered to the needs of TDO students to reduce academic fatigue and improve retention.
- Six questions were directed at counselors to determine their adherence to learning supports, including accommodations and modifications, that HCT provided for TDO students.

The questionnaire, translated into Arabic, to facilitate student understanding, began with an introduction of the research study after which the participants were asked to voluntarily respond to the open-ended questions. All necessary approvals were secured through the HCT Applied Research Department. Participants were informed about the possibility of withdrawal at any time without any repercussions. The questions were designed to cover a 45 minute to 1-hour conversation. Some of the interviews were audio-recorded, noting that participants were also well informed of the possibility of stopping the recording at any time or replay it for clarification. Most importantly, the researcher guaranteed full anonymity through the use of pseudonyms throughout all the reports. The interviews were conducted virtually on zoom where participants were encouraged to switch on their video cameras to trigger engagement. Research questions 3 and 4 were addressed using another qualitative research tool of document analysis. The documents included student assessment data, to compare success rates when the use of accommodations and modifications to assessments are

in place and were utilized. Using observations as a qualitative research tool was directed towards the pedagogy, adaptations, and modifications to the curriculum. The researcher was keen to observe where multimedia content and learning materials was interspersed with regular short tests or quizzes. This played a crucial role in improving student engagement and retention.

Finally, research question 5 directed the focus of the research to provide recommendations to reduce fatigue levels and increase retention through the provision of more collaborative opportunities as learning is inherently social and relationship building (Bollinger and Sheppard, 2010, Morrow and Davis, 2011). Some strategies would be promoted within the dedicated TDO Academic Support Hub to include, but not limited to asynchronous learning strategies, breaking up lectures into manageable fragments, and using assistive technology to allow for heightened interaction and reinforcement activities as gamification or simulation exercises. The target population for this pilot phase included 150 students, 10 instructors and 4 counselors at the HCT.

A qualitative method was most appropriate for the data collection to include semi-structured interviews of the participants - students, teachers and counselors, and document analysis from multiple sources of student data, teaching resources and assessment data. The study employed an investigative approach to evaluate how HCT staff applied their comprehension of implementing strategies to reduce academic fatigue and improve retention, in order to enhance the online learning experience for students across HCT, and thereby achieve the study purpose. Issues faced by students on lack of training in using the technologies, long teaching hours online, back to back lessons, students' concerns about instructors' unfamiliarity with the technology, lack of home support with the online mode of learning, were explored. Focus was placed on the pedagogy, adaptations and modifications to the curriculum.

## **Literature Review**

The sudden change from on-campus learning to distance learning was the direct result from the Covid-19 pandemic. This sudden transition affected both students and instructors. This literature review focused on evaluating effective strategies to support the TDO or special needs students through online learning. The review focused on strategies to enhance the experiences of students in online learning experience at HCT. Synchronous and asynchronous learning are categories of e-learning. Synchronous learning refers to online, real time learning, using video conferencing features. Within the virtual classroom, students could ask questions and instantly communicate and interact with instructors and peers. Asynchronous learning on the other hand, is done offline at a student's own time and pace. With asynchronous learning, tasks are delivered online or sent via email and discussion boards. Many educational institutions used a mixture of synchronous and asynchronous classwork and instruction for online learning. Flaherty (2020), stated that synchronous learning did not always provide students with a variety of disabilities what they required to learn.


Flaherty (2020) also maintained that a more deliberate mixture of live and asynchronous learning was needed for future distant teaching. Hughes (2014), stated the disadvantages of synchronous learning with students stuck to time schedules and the learning pace and structure set by the instructor. He also considered the fact that students were at a loss because they were not receiving individualized attention that they required. Alternatively, he argued the advantages of asynchronous learning, where students made better progress through

interaction with peers and instructors, while reading, listening or observing different types of content. This approach to teaching was highly beneficial to students, including students with disabilities. Students had the option to complete tasks at their own pace, as per their individual needs. With an asynchronous approach, Also, an asynchronous approach gave students the capability to review concepts that they were unsure of, together with related resources. Such an effective strategy had the potential to diminish academic fatigue for TDO students in managing their own time, and study at their own pace that met their educational, social and emotional needs.

Anderson, (2020) noted that the unanticipated transfer to online learning urged the need for students with disabilities to have an equitable education. She mentioned Chris Danielsen, Director of Public Relations for The National Federation of the Blind, who stated that ‘the primary issue for blind students was with learning materials not being compatible with screen readers’. Danielsen stated that ‘with the rush to move everything online in the light of COVID-19, universities needed to pay attention to whether materials were accessible or not for the students’. Tiwary, (2020), asserted that student retention rates could be improved by nearly seventy-two percent with the formation of online communities and portals. He claimed that students performed better as active parts of a learning community, for example, discussion forums which allowed students’ the opportunity to collaborate, engage and bond with other students. Students basically learning with their peers as a social activity, similar to traditional learning in the classroom (Tiwary, 2020). He suggested another strategy of ‘personalized assessments and online course moderators’ (Tiwary, 2020). He held that because course moderators guided and mentored students, providing targeted feedback, this led to increased student engagement and satisfaction. Tiwary (2020), asserted manifestations that students displayed, an indicator for course drop outs. These encompassed erratic completion of work and missed assessment. Early intervention and communicating with these students in a timely manner was critical in comprehending the rationale behind their indifference to work. Therefore, the early intervention strategies were a pathway to early identification and recognition to put in place processes to effect change (Tiwary, 2020). Common challenges with distant learning were the absence of 1:1 contact followed by prompt teacher feedback that the majority of learners preferred, as quoted in (Brown, 1996; Carr, 2000; Garland, 1993; McGivney, 2004, as quoted in Fozdar and Kumar, 2007). "Online education can open the door for learners who are challenged by traditional classroom environments for many students, especially those with social anxiety, autism, or speech difficulties, learning at home could help them engage with study materials at a pace that felt comfortable to them’ (Lynch, 2019)’. Phase 2 of this project after this pilot phase would explore the use of assistive technology in more depth in the TDO Support Hub.

## **Analysis and Discussions**

Thematic categorization of data from the interviews, survey and document analysis were done. The themes that emanated and were analyzed from rich data that was collected and collated fell under five themes. This included professional development, communication barriers, special needs identification processes, time, knowledge of the use of technology, adaptations made to the environment, curriculum, instruction and assessment practices.



**Findings**

**Themes**

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**Reduce Academic Fatigue and Enhance Retention in Online Learning** 8

		TDO Students	Instructors	Counselors
		150	10	4
	Lack of Training	Identification Processes	Knowledge of use of Technology	Time
<b>TDO Student</b>	Not provided	Stigmatisation still a barrier.	Technical support during exams	97% - saves time
<b>Instructor</b>	Not provided	Awareness sessions were limited Timely intervention needed.	100% Special Needs Training needed.	Time consuming to convert traditional courses to online courses.
<b>Counselor</b>	Not provided	Medical forms completed at registration time. Some campuses have a process to update faculty on TDO information. Need for a system wide Approach.	100% Special Needs Training needed.	Used well to provide critical support

Table 1–Findings from the data collected–questionnaires, class observations and document analysis

An analysis of the data revealed the findings that instructors lacked the knowledge to use highly interactive online tools to engage students in an online environment. A fact that tie in with the literature on older faculty in higher education who are not up to speed yet with technological enhancements in teaching and learning. They were in need of continuous, professional development training to raise their skills in using the new technologies with TDO students. Some instructors and counselors relied on using their prior knowledge from their home countries to support TDO students. Professional development should target specific methods and techniques on identifying TDO students and best teaching practices to accommodate them. Interestingly, the responses to RQ1 were mixed. TDO students found using the technology easy. Although it was challenging at the start, they later overcame this challenge which had to do with log-in issues where IT Support resolved the issue. Also, the sampled students preferred the online mode of learning because ‘we saved time travelling’, ‘Online learning was better for me. At home I am safe and away from Covid situations’, ‘I can focus better online’, ‘For me it is easy online’, ‘Yea, I can watch the recordings online’ I can understand better’ to quote some student responses. Taking tests at home was preferred, as they were in their comfort zones and the use of accommodations with extended exam time was a bonus. So time as a key theme was a big positive factor for students.

However, although they provided some benefits for themselves, students with visual impairment and other learning disabilities struggled with the long hours in front of a screen, preferring the instructors to use zoom-in features, which many instructors were not aware of these online features. Additionally, and to answer RQ2, students’ fatigue levels were low after the first few months of the transition to online learning. The norm for two hour lessons proved challenging to TDO students because their schedules had three successive back to back classes. The impact of academic fatigue was palpable and TDO student absenteeism increased because they felt overwhelmed. A solution was sought as a means for quick wins – HCT reduced the length of classes from two hours to one hour, increased faculty and students

contact time for 1:1 support meetings. flipped classrooms and asynchronous learning started taking place with the faculty who were familiar with these e-Learning techniques.

Findings that answered RQ3 was delivered as a stepped approach. Firstly, all HCT academic divisions were requested to engage in a robust process to review and update teaching and curriculum resources to suitable online formats. This was followed by a schedule of professional development (PD) training on the use of online resources for high engagement. These steps had an immediate impact as faculty got empowered and applied new learning innovative approaches to combat fatigue and increase student retention rates. Data collected and analyzed following the ‘quick-win’ approaches evidenced a change in student and staff morale. Faculty started reporting that some TDO students’ attendance improved following the aforementioned interventions. A key factor was that faculty and students started using digital learning tools such as Nearpod, and Padlets, WebQuest and Quizzies and online focus group discussions that facilitated high student engagement to support Tiwary’s (2020) position. These effective strategies using the interactive resources mentioned above facilitated access to learning for TDO students. These innovative practices formed the beginnings of a support program to answer RQ3 and RQ4. The pilot student had limitations due to the pandemic, so RQ3 and RQ4 could not be explored deeper. These will be explored post pandemic during phase 2 of the project.

As curricula updates carried on, together with more PD being offered, faculty began offering a more personalized curriculum, with easy accessibility to online resources for the TDO students. This practice aligned with the vision of the UAE founders for an equitable education for all its citizens, irrespective of their disability of ‘No Emirati Left Behind’. Furthermore, findings included instructors mostly unaware of the SEN identification stages. All the counselors were aware of the identification processes during student orientation, with accommodations put in place. However, there was a lack of a standardized system wide approach across HCT. Familiarity with the terms accommodations and modifications were limited, although extended time, extra handouts, and recording sessions were utilized. Instructors had little communication with counselors, hence many were unaware of TDO students in their classes. Assessment strategy was a sub theme that was identified. Assessments were not modified. However, students with dyslexia were given extended time completing assessments, and there were instances where the assessment was changed from an oral to a written assessment to assist TDO students who had speech impairment. Also, test instructions were given in both languages, Arabic and English, as examples of accommodations. No adaptations were made to course learning outcomes (CLOs). Instructors and students expressed the benefits of having recordings of classes, so that TDO students could review the lesson at their own time and pace. Some instructors also used effective strategies where students recorded oral assessments in place of online presentations that left them nervous. Another strategy was the implementation of competency based assessments that improved student engagement and achievement. Course teams were urged to develop activities that would break up lectures and to use gamification, collaborative and asynchronous learning opportunities in the delivery of lessons. The revised courses were structured on developing an adaptive curriculum that incorporated appropriate accommodations (RQ4) which is ongoing.

As this study moved from the Pilot Phase to Phase 2, RQ5 would be fully answered where a student centered TDO Support Hub would be created as the 1st TDO Support Hub at HCT to serve the needs of the TDO Students. The Hub would provide support using online interactive tools to enhance learning. The use of assistive learning technology as a gateway to



an accessible curriculum to reduce fatigue and increase retention, for example, audio books, desktop magnifying screen, supernova software would be critical devices to support TDO students. This project has secured a AED 200,000 Interdisciplinary Grant to purchase the assistive tools. Future research would evaluate the effectiveness of the support program and extend the TDO Support Hub across other Higher Education entities in the UAE, and Gulf Region.

## **Conclusion**

The study focused on the challenges of academic fatigue faced by TDO students and explored strategies to enhance retention for this specific targeted group of students. Several highly engaging interactive online strategies were explored and implemented with much success to alleviate the stress on TDO students. Recommendations that reduced fatigue and increased retention through the provision of more collaborative opportunities since learning is inherently a social and relationship building activity (Bollinger and Sheppard, 2010, Morrow and Davis, 2011) proved successful. Asynchronous learning opportunities in lessons would reduce stress and fatigue as well as student processing time. Teaching students using a flipped classroom approach, delivering the materials in smaller chunks, use of assistive technology allowed for higher engagement and less fatigue. Also, the use of gamification is not only a fun way to learn but promoted a more engaging experience for TDO students. This study had its limitations where only a limited amount of observations were conducted before full Covid-19 lockdown went into action across the UAE. Hence, observations done remotely through zoom did not prove as effective in ascertaining how students responded to the new ways of learning online when the technological tools are used regularly. Face to face observations will be recommended during phase 2 of the project for better analysis of the outcomes, and the impact of applying online learning strategies.

## **Appendices**

### **Appendix 1 – Questionnaire**

#### **Questionnaire for Summer Research Project**

**Research Method: Semi-Structured Interviews; 1:1 (students) and in Focus Groups (instructors & counselors)**

**Researcher:** *Dr Jacqui Lottin*

#### **Introduction**

After the welcome and introduction by the researcher, participants will be asked to respond to the following open-ended questions. Participation is voluntary. Approvals have been obtained through HCT Research Department. Participants will be informed about their choice of withdrawal from the sample if they so intend without any consequences. The following questions have been designed to guide the scheduled 45 minutes to 1hour conversation and will be audio-recorded. Participants may ask for the recording to be stopped at any time or replayed for clarification. The researcher may be taking notes during the interview.

Finally, the research team guarantees anonymity by using pseudonyms in the report for all students, instructors & counselors in order to protect the identity of each participant. The semi-structured interviews will be conducted through zoom and some protocols with regards to camera begin switched on will be strongly advised to encourage engagement.

#### **Rationale**

Rationale: The purpose of this research project is to address the needs of The Determined Ones (TDOs) in dealing with fatigue from the HCT online mode of delivery of lessons. The study will explore what the needs of the students are, their experience with online learning, the available resources, and will make recommendations on strategies to improve online learning which will reduce fatigue and enhance the learning retention of these students across all HCT Campuses.

Challenges with Online Teaching - (leading to Fatigue and issues with Retention of students who cannot engage).

#### **Questions for Students (one-to-one interviews)**

- 1) What are the benefits you gained with the current online teaching and learning?
- 2) How do these challenges affect your overall learning and success on the course(s)?
- 3) What support and benefits did you receive, e.g. academic support, technical support, psychological or medical support. Please describe the support you have received in facing the challenges?
- 4) How do you think that HCT can better provide the necessary support to meet your needs? For example, academic, technical or psychological support during online and face to face teaching.
- 5) Did you meet with your counselors and academic advisors to discuss your concerns during the online learning? For example, academic concerns, technical or family concerns. If yes, how were these meetings beneficial?

- 6) How would you compare online learning and face to face learning in helping you to understand the content of the lessons?
- 7) Were you able to access the materials online? Please explain
- 8) Do you prefer online or face to face learning? Please explain
- 9) How were you able to engage with online class discussions to enhance your understanding of the learning outcomes?
- 10) What training did you receive to support you with the online learning experience and how did it help you to engage with your teacher and classmates?

### **Questions for Instructors (focus group interviews)**

- 1) Have you had any type of professional development training on teaching TDO students? What was it.
- 2) Are you aware of any TDO students in your classes/and or among your advisees? How was the identification done?
- 3) Are you familiar with accommodations and modifications for TDO students? Describe some strategies you have used.
- 4) Have you modified your assessment strategy and instruments to cater for the TDO students? If yes, please provide some examples.
- 5) Do you use differentiation learning strategies in your classes and how? If yes, please share 2 examples.
- 6) What adaptations to the Course Learning Outcomes (CLOs), assessments and classroom activities have been implemented in your course for the TDO student?
- 7) How would you describe the professional development and training opportunities available for instructors of TDO students? Have you attended any? If yes, what has been the impact on student learning? If No, why have you not attended any?
- 8) Please provide any strategy, delivery improvement, innovation that you have used or would like to share for online teaching of TDO students, e.g. new assessment strategy?

### **Questions for Staff - Counselors**

- 1) Do you know how to access and use the information from the HCT National Admissions & Placement Office (NAPO) portal for the post-secondary student information database?
- 2) What procedures do you follow in the identification of TDO students? Give examples of the steps used.
- 3) What processes do you follow to inform Program Chairs (PCs) and Faculty about the TDO student?
- 4) How do you ensure that the accommodations required are being met during the online administration of Faculty Wide Assessments (FWA) and other assessments, e.g. e-Portfolios, presentations?
- 5) Do you meet with TDO students and discuss their issues and concerns? Why or why not.
- 6) How do you deal with these issues and concerns? Please give two examples.

## **Appendix 2 Participant Consent Form – TDO Student/Counselor/Instructor**

March 2021  
Higher Colleges of Technology  
Abu Dhabi

Dear Student/Counselor/Instructor,

My name is Dr. Jacqui Lottin. I am currently a lecturer and the Education Program Team Leader at HCT, Al Ain Women's College. I am conducting a qualitative study on the impact of online teaching and learning in order to 'Reduce Academic Fatigue and Enhance Retention for the Determined Ones (TDOs).

The purpose of this study is to create an academic support program that will implement effective inclusive strategies to support the needs of TDO students, during online learning. The study will explore what the needs of the students are, their experience of online learning and the available resources to support learning using multimedia content, asynchronous learning opportunities, assessments that improve student engagement and gamification; it will make recommendations on strategies to improve online learning which will reduce academic fatigue and enhance the learning retention of targeted students across all HCT Campuses. The rationale is to develop best practices and pedagogy to support HCT transition to an online learning platform. The program implementation will be monitored for effectiveness and evaluated on its positive impact on students' progress.

The data collection will include remote and in-person (where possible), semi-structured audio-taped interviews, using a questionnaire within focus group workshops. Also, classroom observations of TDO students and document analysis will be conducted. Three research assistants will be utilized at the interview sessions and interviews will be recorded with the permission of the student, and transcribed. Transcripts will be given to the students to check for accuracy. The student questionnaire will be comprised of 10 questions, to be used during the semi-structured interview sessions. The format will be a 45-minutes to one-hour sessions with individual students. Additionally, students' academic performance will be evaluated by comparing students' average exam marks before and after implementing online teaching.

The interviews and observations will be coded to ensure anonymity; all audio tapes will be destroyed after they are coded. Additionally, samples of student work, Intervention Plans, Individualized Education Plans and other relevant documents will also be examined.

The above information is provided to help you decide whether you wish to participate in the present study. You should be aware that you are free to withdraw at any time without affecting your relationship with this researcher or the university.

Do not hesitate to ask any questions about the study before or during the research. I would be happy to share the findings with you after the research is completed. A pseudo name will be used to protect your identity and that of the college in the findings, so your anonymity is assured in line with the HCT's ethical code of conduct. There is no perceived risk for you taking part in this study. The anticipated benefits will be raising a greater awareness of where your teachers are with respect to implementing inclusive education to meet the needs of all the students.

I attach an HCT approval letter requesting your permission to conduct this study at HCT.

Please feel free to contact me if you have any questions or concerns. You can talk to me by phone or email. I am more than happy to provide further information on the study if required. I look forward to hearing from you.

Yours faithfully

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Al Ain Women's Campus  
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Participant Name:

Participant Signature:

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## *A Comparative Study of the Changes of the Language Policy From Colonised India to Independent India<sup>1</sup>*

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The European Conference on Education 2022  
Official Conference Proceedings

### **Abstract**

Linguistic Imperialism<sup>1</sup> is considered very common as we can see nowadays some languages dominate other languages as is the case of the English Language. This paper is a comparative study that investigates the reasons that cause 'Linguistic Imperialism' as a phenomenon, the impact of the British Imperialism on Education in India, and how it affected the language used as a medium of instruction. It also introduced some historical background about the British Imperialism in India and the British practices to suppress the Hindi vernaculars and use English as an official language instead. Moreover, the research also studied some contemporary education policies to identify the phases of language decolonisation in the Indian educational system, and if they have succeeded in promoting their local vernaculars. At the end, the paper provided some recommendations and suggestions that might help educators and local governments instil the value of their local languages in the Indian society.

Keywords: Imperialism, Language Decolonisation, Multiculturalism, Policy

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<sup>1</sup> This paper was first submitted as a term's paper at the British University in Dubai and further developed for the conference

## 1. Introduction

As is the case with the English Language, 'Linguistic Imperialism' is regarded as a widespread phenomenon given the dominance of some languages over others today. (Phillipson, 2018). There are many reasons that cause the previous phenomenon; one of them is 'colonization'. Many of the formerly colonized nations have already gained their political independence, yet the language 'decolonization' has not been completely achieved yet (Leglise & Migge, 2008). The conflict between political independence and linguistic decolonization has been affecting the Education System for so many years as the politically independent countries are still dangling between the must of using their national languages and the fear of losing their prestige when replacing the coloniser's language with their own (Leglise & Migge, 2008).

India is one of the nations that was colonised by Great Britain due to the Imperial Expansion for 116 years from 1858- 1947 (Woodward, 1902). As a result of colonization, English had become the official language of the country. Even after declaring independent, the struggle to achieve linguistic independence is still running.

### 1.1. The Aim of the Study

This paper aims to shed the light on the impact of the British Imperialism on Education in India, especially, the language policy. It also tends to dig deeper to explore the changes that took place in the educational field, hence the language as a medium of instruction since declaring its independence in 1974. The paper also will try to examine the progress of language decolonisation in the Indian Educational system and the language (English) as a medium of instruction.

### 1.2. The Research Questions

This paper aims to answer the following questions:

1. How had the British Imperialism impacted the language policy in India?
2. How has the language policy changed after India's political independence?
3. How is India still suffering from 'linguistic Imperialism' and 'language decolonization'?

## 2. The Impact of the British Imperialism and English in Education (Literature Review)

English has become the global 'lingua franca' in the world nowadays as it is spoken by the majority of people around the world. Furthermore, it is made an official language in other countries whose mother tongue is not English. It has become the language of commerce, law and the medium of instruction in Education (Crystal, 2003).

### 2.1. The Deep Roots of English as a 'lingua franca' in India

In some countries such as India, English has not spread due to globalization or as an impact of using the internet worldwide. The roots of using English as an official language goes back to even before the British Colonisation with the establishment of 'the British East India Company' in 1600s. Consequently, one can say that English started to be spoken in India as a result of the commercial relationship between India and England (Crystal, 2003).

Later, the Brits had showed a remarkable interest in the Indian literature, laws, and religious scripts so much that they translated them to English. Many intermarriages took place later to strengthen the British-Indian relationship (Welch, 2011). I believe that translating the Indian manuscripts to English was the beginning of the Indian language/s withdrawal for English to prevail.

## 2.2. Conceptual Framework

As languages have become an indicator of certain social class, these classes tend to use a 'lingua franca' in their vernacular and in their schools. Doing this, they believe of becoming more superior and sophisticated than common people (McKenzie, 2008). This phenomenon takes place in most developing countries, especially, the previously colonised ones (Mastoi, Lohar & Shah, 2018).

Although most of the formerly colonised countries have become politically independent, these countries might still be colonised linguistically (Leglise & Migge, 2008). That is why this paper tends to explore two main concepts that are considered the main pillars in this study. These concepts are:

- 1- Language Imperialism
- 2- Language Decolonisation

### 2.2.1. Language Imperialism

It is undoubtedly that English is the 'global lingua franca' even after the withdrawal of the British Imperialism around the world. After the end of political Imperialism emerged another type of Imperialism which is the notion of 'globalization' (Crystal, 2003). Globalization, I believe, has more influence on the language worldwide. That is because colonized countries tend to fight the colonisers and its imposed culture and language, yet they welcome globalization and strive to be a part of the modern world with its culture and language (Taylor, 2002).

To solidify its position for English as the global 'lingua franca', one of the conditions to get a good job nowadays is to get a proper score in either IELTS or TOEFL. This made all students and jobseekers all over the world endeavour to learn English to have better life opportunities (Michaud & Colpitts, 2015). This made English as important as life itself for a large party in the globe.

However, the situation in India is slightly different as Indians learn English, not only because they aim for better opportunities, but also because English is an official language in India (Mastoi, Lohar & Shah, 2018). A further reason for the Indians' determination to learn and speak English is to avoid stigmatisation as a low social class. (Mastoi, Lohar & Shah, 2018). The previous facts make one believes that English as a language is the new coloniser in the modern world ruled by the paradigm of 'the survival of the strongest'. By far English language is the one.

### 2.2.2. Language Decolonisation

Decolonization means: "*the release of one country or territory from political control by another country*" ("Decolonization", 2022). Decolonisation is when countries gain liberty

after being politically, economically, and militarily occupied, yet sometimes, these nations take a longer time to linguistically set free from the coloniser's influence.

Because colonisation tempts to make the colonised nation feel inferior, they attempt to find themselves some ways to fit in the context of the coloniser. One way to do so is to learn and use the coloniser's language especially in the educational system (Mastoi, Lohar & Shah, 2018). That is why, even though they are politically independent, the formerly colonised countries keep implementing the coloniser's educational system and using the coloniser's language and language policies (Leglise & Migge, 2008). This creates new generations who have never encountered the colonisers but are still colonised by the colonisers' languages (Sharma, Jha & Kumar, 2015).

Assimilating the conqueror's language into the conquered country results in the birth of diglossia which is the coexistence of two languages in the society: an official or a formal language, mainly the colonisers', and the spoken language, the language of the natives (Garcia, Flores & Spotti, 2017). This is so clear in the Indian textbooks as students still study the British literature, and they are more exposed to the 'British heritage' rather than the Indian culture and heritage. Consequently, it will not be surprising that Indian students know about the British history more than their own (Elder, 1971).

### **2.3. Literature Review**

Many studies introduced the theory of 'post-colonialism' and the 'multiculturalism' model which is considered a direct result of the existence of imperialism in countries. These two perspectives have influenced many aspects such as: economy, ethnography, politics, and education. There is a debate running about education in the postcolonial era; the first argument is that the education system should be liberated from perspectives of the colonisers and that people should not live in the shadows of a gone-by system (Hudson, 2003). On the other hand, Willinsky (1998) argues that the legacy of the colonizers is inherent in the educational system, and it is difficult to change that.

In the Australian model, the government has designed a specific educational policy to address the aspects of the multicultural society that emerged after decolonization (Hudson, 2003). Some Ethnic groups in Australia such as 'Aboriginal and Torres Strait Islander', claiming their rights as 'indigenous' and a part of the Australian culture, have resented the way they were treated as minority. As a result, three types of schools have emerged in Australia: schools for privileged indigenous students, schools for mixed ethnicities, and schools for privileged descendants of European colonisers (Hudson, 2003).

However, the previous schooling system had created many social disturbances in relation to superiority and inferiority which led the 'Queensland State Department of Education' to start designing new policies that address all ethnic groups in Australia (Hudson, 2003). The policy manual included some educational aspects, but none of them addressed the language. That is because during colonization, English had become and still is the 'de facto language' and the official language, and all other languages seemed to have gone into oblivion (Hudson, 2003).

The Chinese and Japanese models were different than the Australian one as they tried to get completely decolonized in the educational system. They gradually changed their educational policies to serve the grand base of the society. In the Japanese model, they used their mother

tongues as mediums of instruction and introduced and supported their culture in their books (Shukla, 1996).

There are many other studies and models about education postcolonialism in many parts of the world, yet the comparative studies that have critiqued the educational policies during and postcolonialism are very rare, especially that the educational policies of many formerly colonized countries are missing or not published for researchers to access and review.

### **3. Methodology**

This paper aims to study the impact of both Imperialism and political independence in India on Education policies reflected in the language policies. The paper aims to use the qualitative approach to investigate the influence of both political statuses. Due to the nature of the research, I could only use the ‘document analysis approach’ to get some answers for the research questions.

The documents that the researcher intends to study are the English policies in Indian schools during and post the British colonization of India. Because the British colonization in India goes back to the seventeenth century, it was nearly impossible for me to get any official documentation of the English policies during the era of colonization. Consequently, I have decided to get some data from old studies that go back to the nineteenth century.

The paper will also study the development of the language policies in Indian national schools from 1961-2020.

#### **3.1. The Qualitative Approach**

The qualitative approach is suitable for the nature of this research as it allows to collect and analyse data by studying documents related to the topic of the study (Creswell, 2014). It also tends to analyse data inductively to structure reason using the ‘bottom-up’ approach to support or negate the research hypothesis (Creswell, 2014).

Moreover, it tends to study social phenomena and interpret them in relation to internal and/or external causes that shape these phenomena in an attempt to understand and unpack them (Merriam & Tisdell, 2015). Consequently, this paper tries to observe the changes in reality which is influenced by the social structure that is presented by the existence of the British entity in colonised India and the withdrawal of this entity after independence.

##### **3.1.1. Content Analysis**

Documents are the pillars up on which this research is built. Studying the Educational policies of Colonized and independent India will provide the data that can be useful to understand how language was taught in the country, and if it was the main medium of instruction back at the time of colonization up till now (Hancock, Ockleford & Windridge, 2009).

The document analysis strategy will allow to understand the sociological structure of the society (Tracy, 2013) and how far they accepted to teach their children somebody else’s culture. This can be concluded by comparing the data collected about the educational policies implemented in colonized India to the policies implemented after Independence and how far these policies have changed due to the nation’s change of status. To be able to complete the

content analysis, the researcher intends to critique the educational policies using the critical theory the ‘Critical Theory.’

### 3.1.2 The Critical Theory (Historical Realism)

As this paper attempts to examine the changes that occurred to the Educational Policies, including language policies, over some variant eras in the Indian history, I believe the ‘*Critical Theory*’ is convenient to relate to. The ‘Critical Theory’ or ‘Historical Realism’ is concerned with the reality that is caused by social, political, and other aspects that can forge that reality over a period of time (Mayring, 2014).

The ‘Critical Theory’ is a kind of ‘social criticism’ that includes judging and evaluating social activities (Thompson, 2017). It also provides an insight of the impacts on social phenomena (Harney, 2015). What makes this theory suitable for this research is that it draws on critiquing policies to construct knowledge in relation to other events in the country (Thompson, 2017). That is why the knowledge extracted by critiquing data tends to be more comprehensive as it links social phenomena to social and/or political events and suggests some alternatives and recommendations for better future interpretations and confrontation (Harney, 2015).

In this case, the paper will use this theory to study and analyse the educational and language policies in India against two political variables: imperialism and independence.

## 4. Findings and discussions

India is a big nation that represents multi-linguicism and multiculturalism. English has become the official language in India as a direct impact of the British colonization. India had been colonized by Great Britain for about two centuries in which a lot of changes in economy, politics, policies, and education had occurred. This paper attempts to introduce some of the changes in the educational systems during imperialism and post independence by trying to find answers for the following questions:

1. How had the British Imperialism impacted the language policy in India?
2. How has the language policy changed after India’s political independence?
3. How is India still suffering from ‘linguistic Imperialism’ and ‘language decolonization’?

### 4.1. Findings and discussions

It was difficult to find a clear-cut answer for the first question due to many reasons. One of these reasons is that it was very long ago when India was colonised, so it was nearly impossible to find people from that era who are still alive to get some answers. Another reason is that almost all educational policy documents are missing, or at least not published to study and review. That is why I have decided to get some knowledge from different studies and historical documents.

#### 4.1.1. The Educational Policy in the Colonized India

As mentioned before, all the findings in this part are extracted from literature, old and new studies and historical documents. It is well known that in the 17<sup>th</sup> century, the Great Britain

was small in area but big in economy (Mastoi, Lohar & Shah, 2018). That was when it decided to invade other countries to exploit their fortunes and add to its own.

When they invaded India, they aimed to create an Indian citizen with '*Indian color but with English taste*' (Mastoi, Lohar & Shah, 2018). One way to do that was by '*Britishising*' the educational system. Lord Hastings, the Governor General back then, started the native education that was endorsed by Britain and introduced to the society as the 'vernacular' schools (Woodward, 1902).

The vernacular schools started in 1840s when the 'General Committee of Public Instruction' reviewed the educational policy and sent the recommendations of 'Governor General' that took place on 24<sup>th</sup> November 1839 to all local committees. The recommendations were to translate the English books to the local vernacular (Tanwar, 2017).

I believe that the previous point is worthy of attention. That is because the British Colonisers used all the ways possible to achieve their dream which is to get to the Indians. They translated Indian cultural books and holy manuscripts to English to be able to assimilate into the Indian society and understand how they think and behave in different aspects of life. On the other hand, they translated important English books to Indian vernaculars to enforce their culture and language and to penetrate the Indian culture and invade, not just the Indian's lands, but also their minds and consciousness (Tanwar, 2017).

Moreover, they developed seminaries that used English as a medium of instruction, but they failed to attract students who preferred Persian over English. To support those English seminaries, they added Persian classes to attract students and encourage them to join. Later, they added native vernaculars like Urdu to those Seminaries (Tanwar, 2017). When they noticed how active those schools were after adding the Hindi departments, they discontinued them to go further with the original plan of '*Britishising*' Education (Tanwar, 2017).

The English departments in the previously mentioned schools used to teach the Hindi students English literature and culture (Tanwar, 2017). On the other hand, Education was not believed to be for everyone. It was meant for the upper class and some of the middle-class students ("NCERT Notes: Indian Education System During British Rule [Modern Indian History For UPSC]", 2022).

I think that the Indians resisted their coloniser's language as a part of their social resistance, so they did not attend the English seminaries, and preferred other languages such as Persian. On the other hand, to be able to have a good grip over the country, the Brits opened English schools for the upper classes which in my viewpoint was clever as they encouraged segregation 'divide to conquer'. This affected the Indians socially as it instilled the notion of superiority and inferiority in the same society.

#### **4.1.2. The Changes in Educational Policies After Independence**

I have managed to find the Educational Policies of years: 1961-1962, 1970, 2011, 2019 and 2020. These policies give a thorough idea about the changes in education policies over the last 60 years after India had gained independence in 1947. This paper intends to review these policies vertically as the paper will review the educational policies holistically and focus on the part in the policy that is concerned with the language (English) as a medium of instruction and/or a school subject.

**The Educational Policy of year 1961-1962:** This policy introduced some reformation in the Indian Educational system in regard to spreading elementary education, providing teachers with appropriate training, raising salary ranges, developing tertiary and physical education, providing welfare of 'handicapped students', and fostering UNESCO programmes in India and research and training (Ministry of Education, 1961).

The previous policy included new measures regarding language:

- 1- Funding new programmes to promote the development of the Hindi languages.
- 2- Encouraging 'children books' competition written in the modern Hindi languages.
- 3- Setting up institutions to teach English as a foreign language and had a role to train teachers who taught English at schools.
- 4- Funding new programmes that help promote the Hindi languages such as supplying the school libraries with Hindi books and translating other books into Hindi languages.
- 5- Facilitating scholarships to study different languages including Arabic, Japanese, Swahili and others.
- 6- Writing books using Braille technique in Hindi languages.

The policy seemed to foster the Hindi languages by designing a lot of programmes and setting up many competitions with good prizes for books written in or translated to the Hindi languages (Ministry of Education, India, 1961).

**The Language Policies and Programmes 1970:** This report presents some changes in some consecutive years starting from 1964 to 1969. Same as in 1961 policy, the educational policy in 1964 promotes the use of local Hindi languages and studying foreign languages such as English simultaneously, yet these foreign languages will be introduced in the curricula of higher education (Pattanayak, 1970). This policy admitted that there was an emerging need for having one official language that can be spoken in India with its multilinguistic nature. English was taught in institutions of higher education as it was important for the Indians to have good opportunities internationally as mentioned in the policy: *'English is our major link with the outside world, and it is likely to continue to be so for many years to come'* (Pattanayak, 1970).

In 1970, the 'Central Institute of Indian Languages' was established to help change the medium of instruction from English to the regional Hindi languages. Some procedures were mentioned in the policy to achieve this goal such as:

- To listen to lectures about common social issues in the mother tongue.
- To paraphrase what students had heard using local languages.
- To read books in English and summarize them in the mother tongues (Pattanayak, 1970).

The reformation declared in the policy seemed to be incremental as they started to move to the local and regional languages, but they could not subside the role of English in the Educational firm as they believed in the significant role of this 'lingua franca' in the Indian society and in the educational system.



**The National Educational Policy 2011:** Although English was previously perceived as a medium of instruction in higher education and the language of the elite, in 2011, it became compulsory to study English as a second language in public schools (Meganathan, 2022).

In the policy, one can sense the covert resistance to English and the urge to replace it as a medium of instruction with local or regional Indian vernaculars. Doing this, I believe that they were trying to marginalize the English language and limit its role in some private schools of the elite class.

**Language Policy 2019:** It included many aspects such as inclusive education, teachers' continuous development programmes, and language policy. The language policy in 2019 included (Ministry of Human Resource Development, 2019):

- Years 3-8 learn numbers and alphabets in their mother tongues and other languages.
- If students are taught with a different language (regional language), volunteers with the students' mother tongue can help students catch up.

The resentful attitude towards English is obvious in the policy as mentioned in many parts that English as a language is not more expressive than Indian ones. Consequently, it is more logical for Indian students to learn in their mother tongues and then learn English as a second language. The policy also encouraged writers and publishers to write math and science textbooks as good as the ones written in English (Ministry of Human Resource Development, 2019).

Moreover, there were other inquiries in the policy about the persistence of some parties in the society to learn and speak English as a mother tongue. However, they gave some justifications for that phenomenon as it was the elite class who kept holding on to English even after independence as a sign of superiority. They also mentioned that people pursued English as it became a 'prerequisite' for many jobs (Ministry of Human Resource Development, 2019).

The policy also emphasized on the importance of learning English as a language, yet the medium of instruction and literature and arts should be taught in the mother tongues. However, students in grade 10 upwards can study and discuss science in a Hindi language and/or English (Ministry of Human Resource Development, 2019). Although the government promoted local and regional languages over English, they gave students the choice to pursue their education or at least a part of it using English as a medium of instruction. This makes one wonders if they really wanted the Indian vernaculars to prevail.

**The Language Policy 2020:** Same as the policy of 2019, the educational policy 2020 set up some rules and regulations regarding many educational aspects like early childhood, curriculum and pedagogy, using ICT, and the continuous professional development of teachers, languages and many more (Ministry of Human Resource Development, 2020).

This policy continued in promoting the Indian vernaculars as mediums of instruction. It was also more comprehensive than policy (2019) with more explanation and elaboration on the importance of multilingualism in the Indian society. Unlike language policy (2019), policy (2020) stated clearly that all math and science books will be bilingual, and students can study both of them in Hindi and English (Ministry of Human Resource Development, 2020).

One more interesting point mentioned in this policy was that India was behind in translating books printed in foreign languages to Hindi due to its pursuit to keep the dignity of the Hindi languages (Ministry of Human Resource Development, 2020).

I believe it is very important to keep the national languages' dignity, but the dignity could have been well preserved if they did not allow students in national schools to choose Hindi or English to study math and science. They could have made it obligatory to study in Hindi vernaculars till graduating grade 12, just like many other formerly colonized countries in the world.

## **5. Conclusion and Recommendations**

### **5.1. Conclusion**

Studying language policies of the Indian subcontinent, one can see the fluctuating attitude towards using English as a medium of instruction or a school subject in National schools. It is undoubtedly that imperialism enforces its language and culture on the conquered countries in an attempt to erase their culture and substitute it with the new culture. The British coloniser tried to do so in India, but it was not easy there.

The British translated the important Hindi books to English to be able to understand the new culture/s they had colonised and maybe to attract more Indians to approve the British existence in India. The next step was to marginalize the Indian culture and language/s by enforcing English and translating the English books to local vernaculars to have Hindi people with '*English taste*'.

Nowadays, the country seemed to have a conflict between following the new concept of globalization and the notion of a global language, and the urge to be linguistically decolonised. This could be seen clearly in the language sections in the latest educational policies. Although they promoted using the Hindi vernaculars as mediums of instruction, they gave students the option to study math and science in English.

Finally, it is true that India has been politically independent since 1947, yet it is suffering from the new imperialism which is the language colonisation. This can be due to many reasons such as: they want to avoid being stigmatised globally as a poor country whose people cannot speak English, so they are not eligible for good life opportunities. Another reason is that some social classes in Indian like to feel better and more sophisticated than the other Hindi people. They achieve that by learning in schools in which English is the medium of instruction and speak English as a mother tongue.

### **5.2. Recommendations**

It is undoubtedly that more research and comparative studies are needed to help India and other countries which share its same history move forward and get rid of the new language imperialism which is caused by globalization. Consequently, the paper suggests the following:

- Using Hindi vernaculars as obligatory mediums of instruction in national schools till the end of the secondary education.

- Promoting the Hindi vernaculars by printing more interesting textbooks for all grade levels.
- Providing teachers with continuous professional development programmes to help them use the local vernaculars in more sufficient and appealing ways.
- Promoting the Hindi vernaculars in the national media and prohibiting programmes that use other foreign languages in the national radio and TV channels.
- Encouraging the translation movement from Hindi to other foreign languages to promote their culture and attract people to learn Hindi languages.

### **5.3. Limitations**

There were many limitations that have been faced while writing this paper. One of them was that the difficulty to achieve triangulation due to many reasons:

- It was difficult to meet people who lived during the British colonization of India.
- It was nearly impossible to implement any ways of collecting data other than document analysis.
- No sufficient number of documents were published to review and critique.

That is why I have tried to study the available studies and documents to develop a viewpoint regarding education and language decolonization in India. Finally, it is undoubtedly that it is a very rich topic for other researchers to study it with different perspectives and in different aspects.

### **Acknowledgement**

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***Research on the Learning Effect of Experiential Learning Theory  
Applied to Design Education***

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**Abstract**

Experiential learning theory enables course study to establish practical experience exchanges, and instructors who take the initiative to provide guidance to learners perform better. Students apply the professional skills learned from their own experience, meet their learning needs, and ask questions from their peers, which can enhance the true value and confidence of cooperative learning. This research mainly investigates the students' learning experience and effect of design education. The advertising design course is used, and the participating students are alternately grouped to serve as the learning group and the teaching group. The survey of learning activities included learning motivation and attitudes, relationship with instructors, and learning effect. The survey of teaching activities included learning ability, peer cooperation and learning involvement in preparing for the course. The research scale adopts the Likert-type five-point scale, and uses the correlation analysis, variance analysis and regression analysis of SPSS to make inferences. The results show that the variables have medium-high correlations, and the involvement of teaching preparation has a significant impact on learning effect. The instructors' learning involvement can predict the learners' learning effect. The exchange of experience in the design field is closely related to peer-to-peer cooperative learning. Traditional learning methods are constantly being revised. If students can accumulate learning experience independently in teaching activities, they will generate new learning abilities and effects. By balancing the roles of learner and instructor in the classroom, students will be able to master what their profession requires and how to achieve learning effect.

**Keywords:** Design Education, Experiential Learning, Cooperative Learning, Learning Effect

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## Introduction

Experiential learning theory believes that learning is a process of experience transformation and knowledge creation. This dynamic process of knowledge creation is the result of individual interaction with the environment, conflict and problem solving. Starting from concrete experiences, reflecting on observations, forming concepts and inferences, and testing concepts in new situations. Kolb divides the learning process into two aspects: information reception and information processing. There are four cyclic learning stages including concrete experience, reflective observation, abstract conceptualization and active experimentation (Kolb & Wolfe, 1981). "Concrete experience" arouses learning interest and motivation, so that students are willing to carefully "reflective observation", "abstract conceptualization" thinking planning and "active experimentation" workplace classroom and learning results, and then communicate through the "concrete experience" of experiential learning, restarting the cycle of experiential learning so that learning can enhance student learning (Alcota, & Gonzalez, 2011; Alejos, Fernandez, Sanchez, & Cuinas, 2011).

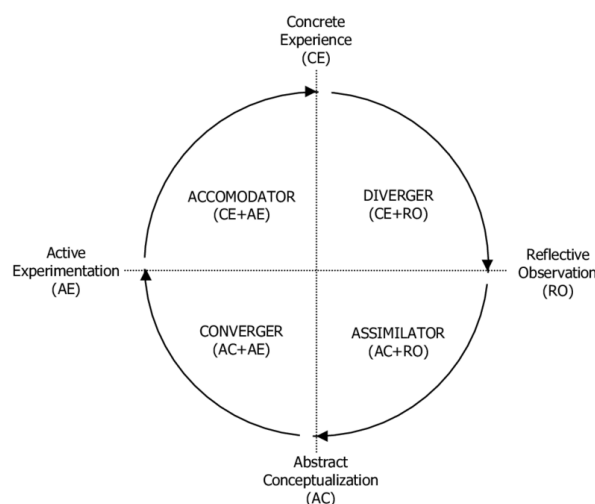


Figure.1: Kolb's Experiential Learning Model

## Experiential Learning and Learning Pyramid

Teaching methods derived from experiential learning allow students to effectively acquire professional knowledge and skills, and new teaching methods and strategies should be considered (Kose, Sahin, & Aysegul, 2010). According to the learning pyramid proposed by Edgar Dale, learning can be divided into passive learning and active learning (Dale, 1969). If learners only passively accept learning, their performance will not be significantly improved, and instructors who take the initiative to provide guidance from others perform better than learners. Students' learning is best when they can guide others. They must not only be familiar with the learning content, but also internalize their knowledge for communication. Before teaching, students must think deeply through the individual, transform, and absorb the content, and communicate with each other. The expression of peer thinking can improve students' own potential ability. In addition to the learning effect, different teaching strategies affect the initiative and passiveness of students' learning style. Discussion, practice, and teaching will form the enthusiasm for staged learning, but in experiential learning, direct, indirect, and alternative experience will have influential impact.



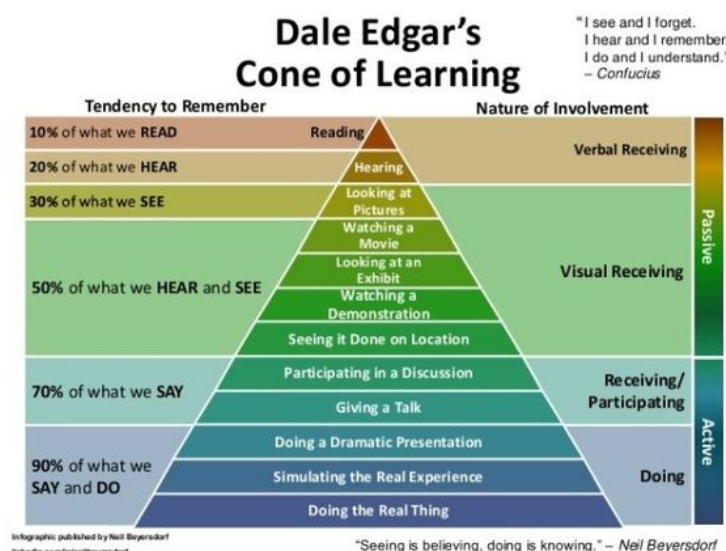


Figure. 2: Learning Pyramid (Adapted from National Training Laboratories)

## Experiential Learning and Peer Collaboration

Experiential learning provides a dynamic learning model that describes learning and development patterns among individuals, groups, and organizational environments through periodic cycles of interaction (Kolb & Kolb, 2008). Combining the characteristics of experiential learning with the application of design teaching practice, and matching students' majors and teaching methods.

This research adopts the experiential learning of design practice, and the learning mode of group cooperation. Cooperative Learning uses the concepts of peer interaction, cooperative skills, and shared responsibility to jointly accomplish learning tasks and goals. Teaching and learning are two cooperative roles, thinking about the inheritance and needs of learning experience, internalizing learning difficulties and skills, and then teaching them to learners. Peer learning increases instructor motivation and communication. Therefore, Cooperative learning emphasizes student-centered, and uses the concept of active learning to enhance the learning effect through the exchange of knowledge and skills, discussion, and questioning. The teaching group compiles the professional skills and learning methods that students need based on practical experience, understands the possible difficulties of students' learning, and seeks guidance skills to guide their peers to actively participate. In the learning group, the motivation of the teaching group is used to enhance the learning motivation, observe the learning attitude, and stimulate the interaction with the instructor, which contributes to the overall learning effect.

## Experiential Learning and Course Content

The experiential learning theory enables learning and courses to establish professional exchanges in the workplace. Practical experience is closely related to design education. Design work is not limited to professional skills, but workplace communication attitudes and coping abilities are the focus of design majors. Traditional learning methods must undergo a process of constant revision and evolution. If the design experience can be accumulated in teaching activities, there will be interactive influences and new learning experiences. Table 1 shows the comparison of empirical theory and learning activities.

Table 1: The Comparison of Curriculum Activity Planning and Experiential Learning Theory

Oriented	Theoretical basis	Activity steps
Concrete Experience	Arouse the interest of students with concrete experiences of actual participation in activities and workplaces.	Observe and understand the needs of the design field, fill in the learning check content and study sheet, establish the learning goals of professional skills, and trigger learning motivation.
Reflective Observation	Observing industry-academia issues and seeking the value of practical experience	Through the design and participation of practical tasks, and the practical experience, the learning content of the three areas of cognition, skills and affection is summarized.
Abstract Conceptualization	Analyze the feasibility of practice by thinking and internalizing knowledge and experience	Integrate practical experience and professional skills and internalize them into design thinking to establish teaching units and activities for cooperative learning.
Active Experimentation	Learning activities that put functional experience and skills into practice	Plan the structured content of learning materials and implement specific teaching sharing activities to verify the learning effect and value of experiential learning theory for design competencies

## Research Method

This study is to evaluate the effect of workplace experiential learning and course peer cooperation, and to use two aspects of teaching activities and learning activities for interactive verification. The teaching group survey includes learning ability, peer cooperation, and learning involvement; while the study group survey includes learning motivation and attitude, learner-teacher relationship, and learning effect. The following are the execution instructions:

### Learning preparation for the teaching group

The teaching group of experiential learning needs to learn and experience in-demand skills independently and draw on their own practical experience to guide thinking or receive information. Therefore, it can actively improve oneself, accept changes in the learning process, and actively interact with peers to solve problems (Roehl, 2013). Learning involvement refers to the level of effort and engagement of students in performing learning activities. Instructors are closely related to the enthusiasm and engagement time of cooperative learning and are also affected by the degree of interaction in the classroom.

### The learner's learning involvement

When students are actively engaged in learning activities, the interaction between the learner and the instructor will increase, and the learning relationship will also improve, so that better learning achievement or performance can be obtained (Kuh, Kinzie and Whitt, 2011). Research on early learning participation has focused more on behavioral-level performance (e.g., classroom presentations, good grades) and less on intrinsic motivation to learn. The design course focuses on students' practical learning process and experience sharing.

Therefore, the survey of learning participation focuses on three variables: motivation and attitude, relationship with instructors, and learning effect.

### Effect evaluation of experiential learning

Learning effect refers to the learning process of learners through teaching, which can be the main basis for evaluating whether teaching objectives and learning expectations are achieved. Blumberg (2016) pointed out that student-centered teaching requires time and practice, and both teachers and students need to understand how to use new teaching methods and how to adapt to changes in classroom teaching to help students improve their learning outcomes. The learning effect of this study is aimed at active learning, so the learning effect is mainly based on the survey of learners, and the learning effect of peer-to-peer cooperative learning is examined based on eight dimensions and 26 factors proposed by Pulkka and Niemivirta (2013). The eight dimensions are included interest, teacher functions, quality of teaching materials, course satisfaction, quality of assessment methods, student effort, achievement, and classroom participation, etc., to measure the effect of experiential learning.

### Participants

The participants of experiential learning in this study are the third-year college students of the advertising design course, which is a cooperative learning of design professional skills and knowledge. The course execution had combined learning experiences in the classroom (classroom teaching) and outside the classroom (workplace experience), so each participating student will work in groups of teaching and study groups. The figure of conceptual framework and hypotheses is shown in following.

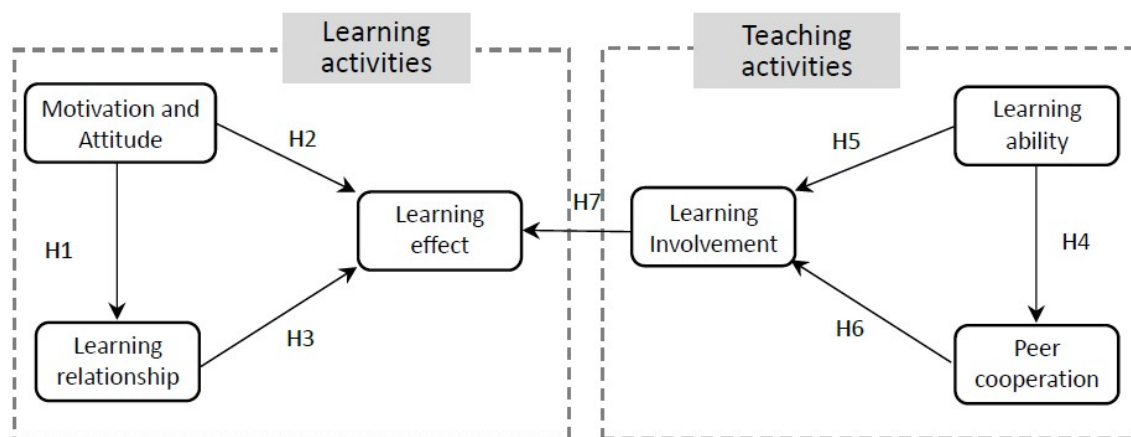


Figure. 3: Conceptual Framework and Hypotheses

### Research Hypotheses

According to the research purpose, set specific questions and research hypotheses:

1. There is a significant interaction among learners' learning motivation and attitude, learner-teacher relationship and learning effect
- H1: High learning motivation and attitude will establish a better learning relationship  
H2: High learning motivation and attitude will lead to high learning effect  
H3: Good learning relationships affect learners' learning effect

2. There is a significant interaction among the instructor's learning ability, peer cooperation and learning involvement

H4: High learning ability builds good peer cooperation

H5: Instructors with high learning ability will have higher learning involvement

H6: Good peer cooperation affects the instructor's learning involvement

3. The instructor's learning participation has a significant impact on the learner's learning effect

H7: The instructor's learning involvement affects the learner's learning effect

H8: Instructor's learning involvement can be used to predict learner's learning effect

## Research Questionnaires and Tools

Research questionnaires mainly investigate the experience learning and effect, covering learning motivation and attitudes of learning activities (learning interest, time investment, concentration, willingness to participate, learning needs, arousing interest, progress, overall progress, learning self-confidence), The relationship between learners and instructors (peer emotion, learning interaction, and peer attention), learning effect (26 questions); learning ability of teaching activities (learning focus, learning direction, helping learning, loving teaching methods, professional ability, communication skills), cooperation skills and peer interaction (study activities, listening to speeches, expressing opinions, accepting opinions, mutual assistance and cooperation, information sharing, solving problems, taking the initiative to ask for help, support and encouragement, discussing matters and discussing opinions), learning input (worth involvement, professional knowledge sharing, peer recognition and sense of achievement and future work ability). The research scale adopts the Likert-type five-point scale, and the higher the score, the higher the degree of recognition of the students. Correlation analysis, variance analysis and regression analysis will be used for each survey variable data to explore the correlation between dimensions, to understand the interactive relationship between teaching and learning two-stage cooperative learning.

Table 2. Result of One-sample t-test

Variances	M	Sd	T	df	Sig.	Mean Difference	95% Confidence the Difference	
							lower	upper
MA	4.400	0.488	22.785	62	.000	1.400	1.277	1.523
LR	4.217	0.706	13.677	62	.000	1.217	1.039	1.395
LE	4.505	0.481	24.840	62	.000	1.505	1.384	1.626
LA	4.433	0.519	21.922	62	.000	1.433	1.302	1.564
PC	4.508	0.433	27.617	62	.000	1.508	1.399	1.617
LI	4.567	0.550	22.608	62	.000	1.567	1.429	1.706

Note: Motivation and Attitude (MA); Learning relationship (LR); Learning effect (LE); Learning ability (LA); Peer cooperation (PC); Learning Involvement (LI)

Table 3. Correlation analysis results between variables

Group	Learning				Teaching			
Variances	M	Sd	MA	LR	LE	LA	PC	LI
Motivation and Attitude (MA)	4.400	.488	1.000					
Learning relationship (LR)	4.217	.706	.599** .000***	1.000				
Learning effect (LE)	4.505	.481	.798** .000***	.684** .000***	1.000			
Learning ability (LA)	4.433	.519	.752** .000***	.591** .000***	.768** .000***	1.000		
Peer cooperation (PC)	4.508	.433	.678** .000***	.687** .000***	.712** .000***	.750** .000***	1.000	
Learning Involvement (LI)	4.567	.550	.664** .000***	.698** .000***	.752** .000***	.714** .000***	.748** .000***	1.000

Note: \* $P < .05$ ; \*\* $P < .01$ ; \*\*\* $P < .001$

## Results

According to the results of one-sample t-test (see Table 2), each variable has reached a significant level, indicating that the participants' motivation and attitude (MA); learning relationship (LR); learning effect (LE); learning ability (LA); peer cooperation (PC); learning involvement (LI) have significant differences. According to the correlation coefficient (see Table 3), there are high and medium correlations between all variables.

According to the results of ANOVA (see Table 4 and Fig. 4), for the participant of Motivation and Attitude (MA), the Learning Relationship (LR)  $F_{(14,48)}=3.486$ ,  $p=.001<.01$ ; the Learning Effect (LE)  $F_{(14,48)}=13.676$ ,  $p=.000<.001$ . For the participant of Learning Relationship, the Learning Effect (LE)  $F_{(8,54)}=9.353$ ,  $p=.000<.001$ . For the participant of Learning Ability (LA), the Peer Cooperation (PC)  $F_{(12,50)}=10.470$ ,  $p=.000<.001$ ; the Learning Involvement (LI)  $F_{(12,50)}=6.304$ ,  $p=.000<.001$ ; For the participant of Peer Cooperation (PC), the Learning Involvement (LI)  $F_{(28,34)}=9.353$ ,  $p=.000<.001$ . For the participant of Learning Involvement (LI), Learning Effect (LE)  $F_{(28,34)}=7.445$ ,  $p=.000<.001$ . Hypothesis 1 to 7 are confirmed.

Table 4. Result of One-way ANOVA

One-way ANOVA						
Learning activities		<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>sig</i>
MA→LR	Between	15.590	14	1.114	3.486	.001**
	Within	15.335	48	.319		
	Total	30.924	62			
MA→LE	Between	11.463	14	.819	13.676	.000***
	Within	2.874	48	.060		
	Total	14.337	62			
LR→LE	Between	8.328	8	1.041	9.353	.000***
	Within	6.010	54	.111		
	Total	14.337	62			
Teaching activities		<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>sig</i>
LA→PC	Between	8.338	12	.695	10.490	.000***
	Within	3.312	50	.066		
	Total	11.649	62			
LA→LI	Between	11.304	12	.942	6.304	.000***
	Within	7.472	50	.149		
	Total	18.776	62			
PC→LI	Between	16.143	28	.577	7.445	.000***
	Within	2.633	34	.077		
	Total	18.776	62			
Learning and teaching		<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>sig</i>
LI→LE	Between	10.409	8	1.301	17.883	.000***
	Within	3.929	54	.073		
	Total	14.337	62			

Note: Motivation and Attitude (MA); Learning relationship (LR); Learning effect (LE); Learning ability (LA); Peer cooperation (PC); Learning Involvement (LI); \* $P < .05$ ; \*\* $P < .01$ ; \*\*\* $P < .001$

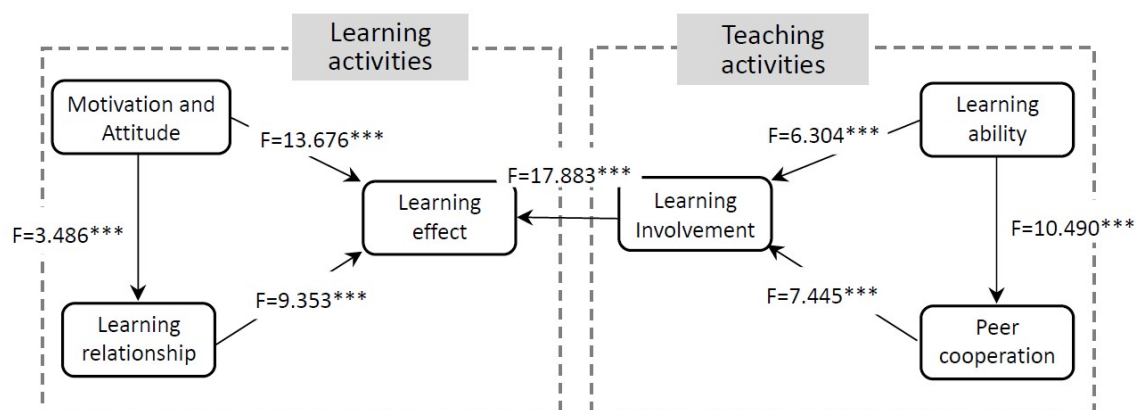


Figure.4: The research framework of experiential learning and the results of ANOVA analysis

Table 5: A simple regression analysis of students' learning activities  
Model Summary

Model	R	R square	Adj. of R square	Std. Error of the Estimate	ANOVA	
					F	Sig.
1	.893 <sup>a</sup>	.797	.786	.233961	77.116	.000***

a. Predictor: Learning Involvement (LI), Learning ability (LA), Peer cooperation (PC)

b. Dependent variable: overall learning activities

Coefficient (a)

Model		Unstd. Coefficients		Std. Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.066	.312		-.210	.834
	Learning ability (LA)	.264	.095	.271	2.772	.007**
	Peer cooperation (PC)	.344	.119	.295	2.890	.005**
	Learning Involvement (LI)	.376	.091	.409	4.135	.000***

a. Dependent variable: overall learning activities; \* $P < .05$ ; \*\* $P < .01$ ; \*\*\* $P < .001$

Table 5 shows that teachers' variances explained 78.6% of overall learners' activities:  $F_{(3,59)}=77.116$ ,  $p=.000<.001$ . Learning Involvement (LI), Learning Ability (LA), Peer Cooperation (PC) are all selected to be predictors of overall learning activities. The relationship between three instructors' variances and overall learners' activities are positive and statistically significant, Learning Ability ( $\beta=.264$ ,  $t=2.772$ ,  $p=.007<.01$ ); Peer Cooperation ( $\beta=.344$ ,  $t=2.890$ ,  $p=.005<.01$ ); Learning Involvement ( $\beta=.376$ ,  $t=4.135$ ,  $p=.000<.001$ ), indicating that the higher the teachers' variances (LA, LI and PC), the greater the influence on the learners' variances (MA, LR and LE).

## Findings

Experiential learning in design education, when learners have high learning motivation and attitudes, will enhance the relationship between learners and instructors, and will improve the learning effect of learners. The instructor's learning involvement will be affected by the learning ability of the content and method. Peer interaction and cooperation skills can also enhance the instructor's learning involvement.

Compared with traditional teaching, cooperative learning can improve students' involvement and learning effect. Experiential learning enables the teaching group and the learning group to generate more positive interaction and dependence, enhance personal role responsibility, group cooperation skills, and exchange of actual work and feelings of group process.

## Conclusions

The integration of experiential learning into design education fully stimulates students' active learning, and teachers play a leading role in learning and inspire students' goals. Compared with traditional education, experiential learning in design majors enables students to learn more efficiently and actively. There are the following conclusions:

*Importance:* Improving the teaching methods of traditional design classrooms and flipping students' learning roles in the classroom.

*Inspiration:* The evolution of students' learning roles can improve learning motivation and course participation, not only in-depth learning, but also strengthen students' internalized learning ability and experience sharing and improve the effect of function-oriented learning.

*Implementation:* The learning method of workplace experience and classroom co-learning, flipping the learning relationship between students and peers, and combining the roles of learners and instructors in traditional classrooms, so that practical learning and thinking have a synergistic effect.



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***Developing a Conceptual Model: Integrating CALL in TBLT***

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**Abstract**

Over the last 20 years, task-based language learning (TBLT) has gained immense recognition from linguists all over the world. With the seamless assimilation of technology in the lives of educators and learners, a strong and growing body of literature has supported the efficacy of computer-assisted language learning (CALL) over the last decade. Recent research has proved the positive aspects of technology-mediated classrooms. As the two methodologies have matured and excelled in language classrooms, this research seeks to explore the interconnectedness of the two approaches and the intersection of technology to facilitate learning. The study investigates the affordances that technology-mediated task-based instruction brings in language learning. Furthermore, in light of the data gathered, the study is framed around grounded theory using coding and reflexive comparison to bring forth a modifiable conceptual model that consolidates the centralities of both TBLT and CALL models while keeping students at the centre of the paradigm.

Keywords: TBLT, CALL, Grounded Theory, Conceptual Model

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## Introduction

Since the inception of task-based language teaching (TBLT) more than thirty years ago, it has received much attention from educators in second language acquisition. This process-oriented approach to language teaching centralizes around communicative language teaching (Nunan, 2006) with the essence of accumulating communicative tasks at the core of its instruction in a curriculum. Unifying learning around tasks provides learners with an experiential learning platform where students are engaged in the target language for meaning-making, understanding form and using language for communication in real life. Originating from Dewey's approach (1998) of experiential learning and rooted in sociocultural theory, this framework has taken many adaptations to fit the needs of students. The two most acknowledged TBLT designs centred on task-based stages were developed by Willis (1996) and later by Ellis (2006). The former involves a focus on language and form, whereas the latter agrees on communicative competence. However, in this age, as technology has seamlessly integrated into many aspects of learners' lives, educators alike have embraced the rise of technology and research has generated an increasing number of studies that well incorporate technology in language teaching (Ziegler, 2016; Blake, 2016). Manifesting on the various challenges in implementing TBLT in language classrooms, Lai & Li (2011) discovered the constraints could be minimized with the inclusion of technology in language teaching. In addition to the agreeable relationship between technology and TBLT, several researchers have looked closer to the interaction between digital literacy and TBLT. Research has also proved that language learning via technology motivates and engages students (Ziegler, 2016; Chong & Reinders, 2020).

This study endeavours to explore the technological proficiencies that TBLT can provide while incorporating CALL at its core in student-centred learning. Since 21<sup>st</sup>-century students are digital natives and believe in multimodal and multitasking manner, the use of technological gadgets like laptops, tablets and mobile phones is a norm to them. Hence, language teachers are welcoming Web 2.0 technologies in language classrooms benefitting the millennials with technology and upgrading their traditional face-to-face lessons. Moreover, TBLT researchers have not ignored the potential of fruitful synergies between the two theories. Collaborative technology-mediated tasks promote productive language output through interaction which motivates students to continue improving their language skills (Gonzalez-Lloret, 2020).

The affordances that CALL provides to TBLT underpins sociocultural and interaction theories advancing in language learning by providing synchronous and asynchronous learning environments. However, integrating the two models and formulating a model that consolidates the interconnections between the two has not been explored yet. Such an integrated model has not been found in the existing body of literature as far as the researcher has discovered. Technology mediation has informed and transformed learning over the last two decades, hence, CALL as an approach has been discovered to contour and navigate language learning competence. Many researchers have presented studies that conjoin both approaches to facilitate learning. Having a plethora of literature available to study devoid of any model, the researcher chose to develop a model to fill the gap and present a foundation for CALL and TBLT in literature that hasn't been prepared so far.

## Literature Review

A growing body of literature has augmented task-based language learning from the last three decades. However, with the advent and normalcy of technology in every sphere of life, technology has seeped its way into education and flourished in language acquisition. Technology-enhanced language learning has provided a novel dimension to researchers by integrating it for meaningful learning in face-to-face as well as remote learning. This body of literature synthesizes task-based learning, computer-assisted language learning and the affordances technology provides forming an innovative pedagogical framework to fill the gap in the literature.

## Task-based Language Teaching – TBLT

TBLT is a process-based approach that has gained significance as a methodological and pedagogical approach with theoretical underpinning traced back from John Dewey's (1998) and Prabhu's (1987) work on experiential learning or 'learning by doing'. Additionally, sociocultural theory involving its discourse-oriented nature with collaborative interaction gruelled its way in TBLT by engaging in language-oriented tasks (Tanaka, 2005). Moreover, TBLT works in the zone of proximal development of students ensuring that language is developed from scaffolding and interaction with peers. This foundation stresses the importance of experience and relevance to learning. Henceforth, basing the definition on the synthetic approach of learning, Nunan (2006) defined task as real-world activity and pedagogical tasks by simplifying learning into constituent parts and introducing each part separately and step-by-step. Willis (1996) defined task as a goal-oriented activity in which learners achieve a real outcome. TBLT does not depend on prior analysis of language learning and depends on unit of focus where the emphasis is placed on authenticity, interaction, meaning and learners' engagement with the language (Ziegler, 2016). Long (2015) referred to this as whole learning or holistic approach to learning by stressing the importance of learners; current and future communicative needs while engaging in authentic interactions. Ellis (2006), stated the stages of a task-based lesson with the task as a crux at each stage. Out of various designs proposed (Prabhu, 1987; Willis, 1996), all constitute three principles that reflect the chronology of a task-based lesson. Ellis (2006) entails the task-based lesson in three categories namely pre-task, during-task (the obligatory phase) and post-task. 'During-task' is based on the centrality of the task using different instructional techniques for students to work under a time restraint and get ready for the production stage. Finally, post-task involves follow-up activities on task performance. The pre and post tasks are not mandatory, yet their role is crucial in ensuring that task performance is optimal and effective for language development. Skehan (2003) raised his concerns on task complexity, careful planning of pre and post tasks, the familiarity of tasks and interactivity among participants. More recently, Long (2015) provided a framework based on Skehan's approach urging instructors for a need analysis, classifying tasks, developing pedagogy and sequencing tasks to form a syllabus.

Collectively, based on all the literature gathered, TBLT has laid its foundation in language acquisition concurring with seminal theories and presenting its basis for language learning using authentic meaningful tasks that involve peer collaboration.

With the seamless addition of technology in daily lives, the principles of task-based learning have intersected with computer-assisted language learning to provide a pedagogical framework that supports technology integration. Technology-mediation in TBLT has

extended the conceptualization of task (Zeigler, 2016) that includes EdTech tools and mobile assisted learning. Tasks, as a result, were reconceptualized and redefined with a focus on meaning, goal orientation, learner-centeredness, holism and reflective learning (Gonzalez-Lloret, 2014).

### **Computer Assisted Language Learning - CALL**

Owing to the increase in computer literate people since the 90s, Chapelle (2001) was amongst the pioneers to decipher the relative correlation between technology-mediated instruction using task-based learning methodologies. The inclusion of innovation in learning has led to teachers' attraction and exposure to language teaching (Pierson, 2015). Chapelle (2003) researched beyond the gimmickry of technology and its diverse use in language learning. Thus, ubiquitous technology brought the potential benefits of communication which motivated the students in their writing tasks using blogs enabling them to receive individualized and personalized feedback (Cummins & Sayers, 1995; Rashid, Cunningham & Watson, 2017; Chen & Brown, 2012). Moreover, the challenges associated with the successful implementation of TBLT has coaxed the proliferation of technology in classroom contexts. Students' passive learning styles and overreliance on teachers, crowded and packed classrooms, diversity in learning styles, and students' avoidance in using the target language for communicative purposes are few temporal and physical challenges that hinder in reaping the complete benefits of TBLT (Carless, 2004; Bruton, 2005). These barriers could be potentially minimized with the incorporation of technology mediation in language learning (Chapelle, 2003). Recent research has proven that CALL-mediated language learning can promote productive skills both written and spoken, and the interaction pattern facilitates language acquisition (Gonzalez-Lloret, 2020). Another qualitative research based on the synthesis of 16 technology-mediated TBLT studies evidenced an emergent theory highlighting the constructive impact of technological materials and tools that attempt in authentic, meaning-focused and learner-centred tasks. This develops language and non-language skills, but it is contingent upon the teacher, student and environmental factors (Chong & Reinders, 2020). Moreover, previous research also indicated the importance of reading fluency in students of determination with technology-mediated instruction and proved it to be motivational for learners (Ozbek & Girli, 2017). A plethora of research is available that supports the intersection of technology in all four language skills with CALL as a framework in a more multimodal context where learners enjoy autonomy in producing language in different forms (Blake, 2016). Blake (2016) also posited that CALL coupled with TBLT produces a goal-centric approach enforcing learners to combine language skills in ways that engage them with digital facets in their own lives. TBLT language tasks heavily rely on meaning-oriented authentic tasks to achieve target language. For this purpose, CALL creates an environment of a *Brave New World* that is worth taking advantage of its affordances for L2 learning (Kern, 2014; Blake, 2016). This view is also supported by Zeigler (2016) that technology-mediated TBLT provides a framework of a mutually beneficial relationship, however, the impact of multiple methodologies and their impact still needs to be explored. Another longitudinal study suggested that technology apps like WhatsApp and other social networking apps significantly increase the performance of language learners (Taj et., al., 2017).

A large and growing body of literature has been investigated and published in the last 10 years owing to the congenial relationship between CALL and TBLT. On the contrary, a few noteworthy studies elaborated on the drawbacks like training on technology to skillfully use it

and delayed feedback as a concern (Paepe, Zhu & Depryck, 2018; Shadiev & Yang, 2020; Chong & Reinders, 2020).

Overall, major evidence from the study reveals that the advantages of technology outweigh its weaknesses. Teachers, learners and stakeholders have to devise ways to integrate and garner the benefits of technology that is freely accessible and widely available. Furthermore, collectively these studies outline a critical role of CALL in TBLT in enhancing language learning and serving as an educational framework. However, there is no noticeable study found in the literature that provides an integrated conceptual model for teachers to follow incorporating both CALL and TBLT.

### **Affordances of technology in language learning**

There is a need for researchers to broaden the conceptualization of tasks beyond mere pedagogical and linguistic competencies (González-Lloret, & Ortega, 2014; Ziegler, 2016). A comparative study of technology and paper-mediated study in ESL classroom expressed the preference of more than 75% of participants in using technology (Payant & Bright, 2017). Moreover, the studies of Chen & Chih-Cheng (2018) discovered ESL learners' positive attitudes towards task design and implementation in technology-mediated TBLT that expanded language skill and learning gains. Research has established the positive effect of technology in language learning, however, to realize the full potential of technology in TBLT, it is imperative to consider the affordances that technology provides as a pedagogical tool to extend the learning experience and proficiency (González-Lloret & Ortega, 2014). Affordance is an opportunity for educational activity supported with technological features. Educational affordances of mobile technology presented by Churchill (2017) in a study by Xue (2020) summarizes resources, connectivity, collaboration, analytical and captivity as major affordances. Moreover, similar studies have reported facilitation, collaboration, interaction, positive attitude, student-centred learning, development of non-linguistic skills, freedom and flexibility and affective dimensions as affordances for technology in language learning (Blake, 2016; Payant & Bright, 2017; Chen & Chih-Cheng, 2018; Chong & Reinders, 2020). Based on the aforementioned evidence gathered that provide stimulating knowledge through authentic tasks, there still needs a conceptual paradigm that encompasses technology-mediation with students at its centre. The research indicates the impact of technology but the proposition of a pedagogical design that provides potential benefits of both CALL and TBLT still needs to be lamented.

### **Methodology**

The complexities to understand the phenomenology were captured using grounded theory (GT) to analyze the qualitative findings that develop from 'extant data' (Charmaz, 2006). The grounded theory applies inductive technique and a theory is developed from research that is grounded to the data collected. The theory suggests a continuous interplay between data collection and data analysis (Cohen, Manion & Morrison, 2018). According to Glaser & Strauss (1967), a researcher discovers what is relevant as mentioned in their seminal work *The Discovery of Grounded Theory*. The intention of grounded theory is to build and generate a theory on existing theory rather than testing theories. This occurs with constant data analysis and comparisons that help in the formulation of a new theory (Cohen, Manion & Morrison, 2018).

Out of the three versions of grounded theory, the author relied on the constructivist model of grounded theory by Charmaz (2006). The constructivist model attributes subjective meanings from the data and there might be multiple meanings from the interpretations that will enable co-construction of knowledge. The researcher opted for this theoretical basis as it rejects objectivity (Glaser & Strauss, 1967; Strauss & Corbin, 1998), rather relies on subjectivity, interaction and constructivist methodologies. As an initial literature review scoping method was used to explore the relevant literature in order to map the key concepts underpinning the uses of CALL for teaching task-based language learning in undergraduate English classrooms in ESL settings. The scoping literature review method used for this study was taken from Arksey and O'Malley (2005).

Further, inclusion and exclusion criteria to narrow down the literature review was applied to form conclusions to the study. Using EBSCO host, various peer-reviewed journals from 2016 onwards were researched using different search phrases like: computers and task-based language teaching; CALL and task-based learning; technology in language learning; TBLT in higher education; TBLT in ESL; computers in ESL classrooms; computers and language teaching; computers and language teaching; technology in language learning. First, seminal studies were included by constantly comparing and analyzing the literature in different quantitative and qualitative studies. The literature review, in this case, sets the historicity, familiarization and contextualization of the study (Charmaz, 2006).

Although the most popular way to conduct grounded theory studies is interviewing, there are no evidence that prove a preference for interviews as a primary source of data (Ralph, Birks & Chapman, 2014). Charmaz (2006) attests that documents, extant data, technical literature or textual data can be used as a primary or secondary source of data collection. In light of the constructivist GT tradition, the author utilized an informed grounded strategy with a constructivist approach by taking the advantage of pre-existing theories and research findings creatively and flexibly (Thornberg, 2012). This criticality led to the modification of existing models by paying attention to potentially relevant and important information in the extant data, and thus the development of a new conceptual model.

## **Data Analysis and Results**

The researcher after finalizing an endeavour to GT, sampled and categorized the data relevant to the research objective of the study. This process of data collection for generating a theory involved coding, analysis and further data collection to develop an emergent theory (Glaser & Strauss, 1967). The researcher kept adding data to the literature by continuously refining the categories until enough data was gathered. The researcher delved into the theories until a theoretical saturation (Charmaz, 2006) arrived where no more concepts, definitions or theoretical categories arose from the literature and appropriate data was gathered to evolve and emerge a novel, technology-mediated conceptual model.

The process of coding began by disassembling and breaking down the data into discrete parts. It is an analytic process where concepts to data and phenomenon are attached during qualitative data analysis. The researcher segmented data into meanings for categories and fragments. Furthermore, the data was organized and structured under themes (Cohen, Manion & Morrison, 2018). These codes were achieved by a thorough study of TBLT and CALL. Axial coding at this point helped in establishing interrelationships between both the educational methodologies and came forward with the affordances of technology in TBLT. This interplay between the two models proceeded to the construction of a new model. Next,



generating memos are an important stage in this process. The author electronically wrote ideas, emerging themes, summaries, explanations and reflective analysis of the data gathered.

Constant comparison or reflexivity is most important in grounded theory. This constant reflexivity acknowledges the need for denying prior knowledge, preconceptions and theoretical influences (Ralph, Birks & Chapman, 2014). The researcher utilized constant comparison by coding incidents and comparing them with previous incidents which helped in categorization. Since the research involved the study of two theories, the author constantly reflected and analyzed all possible similarities and disparities in both seminal studies. This resulted in forming a common ground where the researcher evolved a new conceptual model that embedded the commonalities of both theories and incorporating the affordances of CALL to form an emergent and modifiable model. Constant comparison analysis led to the development of core variables that integrated concepts and more key categories. These categories served as a core of the emerging theory.

This research is limited to a particular phenomenon and grounded in existing theories to result in an emergent theory. The research is restricted to the explanation of a particular research objective to discover a phenomenon. Therefore, it does not have a wider application and cannot be generalized in other contexts. It is up to the readers' discretion to evaluate it as a grand or middle-range theory (Cohen, Manion & Morrison, 2018).

## **Findings and Discussion**

Originating from the early 1950s from behaviourist CALL to communicative and integrative CALL, there came a surge of advancement in the 1990s with the emergence of the World Wide Web. The findings in this section are driven by the dense literature, personal experience in ESL teaching, empirical and critical reviews published since 2016. In light of the affordances of technology in TBLT and its use in all four language skills, the author will propose a conceptual model integrating affordances of CALL into the TBLT approach. The researcher acknowledges TBLT models by Ellis (2006) and Willis (1996), therefore, the study adopts parameters from both the models by choosing stages that fit the purpose of the study. While the first two stages in both the models offer similarity in the task definition, selection of resources, planning and reporting, however, there is a noteworthy variance in the third stage of both models. Willis's (1996) model encapsulates 'language focus' with form practice and analysis components, on the other hand, Ellis's (2006) model does not offer a direct focus on language form. While students are in the centre of each paradigm, encircled by sociocultural and interactive contexts, the proposed conceptual model will provide a holistic approach to language teaching, assimilating technology at its core. The findings of the study reiterate the implications of Chong & Reindeer (2020) where they believe that appropriate tasks, a congenial environment for learning and teacher readiness are the prominent features in integrating technology with TBLT. Moreover, in milieu to the conceptual model of Xue (2020), this study synergizes and serves as a roadmap incorporating the affordances of CALL in TBLT.

The proposed model will be first adapted from the stages of Ellis (2006) and the last stage will incorporate strands of Willis's (1996) model to give an all-inclusive impression of technology integration in the task-based learning model.

Phase	Examples of options
A. Pre-task	<ul style="list-style-type: none"> <li>* Framing the activity (e.g. establishing the outcome of the task)</li> <li>* Planning time</li> <li>* Doing a similar task</li> </ul>
B. During task	<ul style="list-style-type: none"> <li>* Time pressure</li> <li>* Number of participants</li> </ul>
C. Post-task	<ul style="list-style-type: none"> <li>* Learner report</li> <li>* Consciousness-raising</li> <li>* Repeat task</li> </ul>

Figure 1: Task-based Learning Framework (Ellis 2006)

### CALL in the Pre-task stage

Under the framework TBLT provides for language learning and featuring 'learning by doing' (Dewey, 1998), the learners' exhibit skills adapting the principles of task-based learning in digital environments (Gonzalez-Lloret, 2015). Primarily, TBLT boasts for its uniqueness due to its authenticity and meaning-focused tasks that facilitate interaction in a second language.

The pre-stage task as mentioned by Ellis (2006) captures the teachers' ability to activate students' schemata, engage students in tasks that facilitate the transition of learning from pre to during task stage with formal instruction as an initial task. The learners are introduced to resources that are drawn from linguistic features and facilitated by the affordance of technology to attempt the task (Xue, 2020). As Skehan (2003) mentioned to conduct a need analysis, at this particular stage a teacher can use game-based strategies like a short engaging Kahoot or a Quizizz to identify the gap before the real instruction begins. Moreover, students' ability to utilize the technology to maximize the learning opportunity has to be introduced at this stage. The choice of linguistic resources needed to complete the task and non-linguistic outcomes are prerequisites at this stage (Ellis, 2006).

Technology integration for remote learning needs to identify asynchronous and synchronous communication that occurs between teachers and students to facilitate the task. This refers to the interaction, communication and collaborative affordances that technology contributes to learning. Synchronous videoconferencing technological tools like Collaborate, Skype, Zoom typically allow learners and teachers to engage in real-time discussions to trigger students interest in the topic by introducing pictures, brainstorming ideas and speed chatting by answering questions on the topic. Asynchronously, students can be engaged with the translation of lexical items as a pre-reading stage using Quizlet that offer flashcards and test practices for language learners. Moreover, Flipgrid, Snapchat, B612 and other Vlog applications serve as asynchronous communication tools for recording videos with a voiceover which can later be shared with peers and teachers. This gives students time to plan, think and act before submitting tasks. The options are vast in embedding technology in instruction from encompassing Web 2.0 tools to virtual reality leading to augmented reality for generation Z.

## **CALL in the During-task stage**

This stage is the core of TBLT in task performance where learners complete the task in collaboration with their peers. Collaboration is the fundamental aspect of TBLT as it provides opportunities to learners for interaction and engagement in the achievement of tasks through its positive cyclic reciprocal process (Xue, 2020). This communication occurs due to the setup of meaningful tasks that encourage students to share knowledge of past experiences, contextualize meaning, and construct new knowledge from scaffolding and socio-cultural interaction. This creates an environment of constructivism, learner-centred interaction and linguistic competence to complete the tasks which can be commendably performed in groups with technology mediation. Collaborate Ultra and Zoom break-out rooms provide an opportunity to split the class into smaller groups where students can think analytically and reflect on their practices fostering learner autonomy. This technology mediation also provides a chance for oral or written feedback which is a source of intrinsic motivation for passive learners. Consequently, this serves as self-regulation by cultivating a positive attitude among learners, eliminating anxiety and dealing with real-life problems along with the repetition of tasks post-feedback (Ellis, 2006; Chong & Reinders, 2020). These technology affordances can be employed by exploiting different online apps and YouTube is amongst the prominent ones for providing authentic videos on multiple genres. YouTube videos can be annotated with questions, comments, and comprehension tasks that serve best for Listening and Reading activities (Blake, 2016). Furthermore, these videos can be embedded in other EdTech tools like Nearpod, Bookwidgets and ISL collective which provide a student-centred learning environment while offering a variety of activities depending on students' level and interest. These platforms are best suited for blended and remote learning platforms as they enable the teachers to track students' performance, scores, speed and provide feedback instantly. Randal's ESL lab is a freeware platform for students to listen and comprehend authentic materials from native language speakers.

Accordingly, CALL has been consistently highlighted in the L2 reading. The most frequently mentioned advantage of CALL is textual persistence that gives learners a chance to process unfamiliar linguistic structures (Payne, 2004). To further incorporate game-based learning strategies in online environments, reading quizzes in Kahoot and Quizziz fosters enthusiasm and thrills students in blended learning environments. Furthermore, BookWidgets with WebQuest, Nearpod, Dreamweaver, Readtheory provide comprehensive learning by forming integrated lessons that can be both teacher and student-paced. Teachers' upon their discretion can enhance the reading tasks by utilizing other LMS platforms to encourage students to write shorter texts. The array of writing tools includes Padlet, WhatsApp, Facebook, Instagram and Twitter which provides real-time textual communication to millennials who are native to these apps. These social media handles extol the virtues of the collaborative writing approach. Text composition which requires significant length can be shared through wikis, blogs, discussion boards, google docs and other platforms. The end product of all these activities is student's artefacts that can be saved in online and offline libraries.

## **CALL in Post-task/Language Focus stage**

The last stage of TBLT is the post-task stage where evaluation is a crucial part of effective learner-centred learning experiences. The post-task phase affords some major options not just limited to repetition of a task but encouraging self-reflection on task performance and paying attention to the problematic forms that occurred while learning (Ellis, 2006). Apart from these propositions, Willis's (1996) model emphasizes 'language focus' by practising new

words, phrases and patterns including the form and meaning of the target language. The author rejected this argument and accepted Ellis's model and opted for the concise and integrated conceptual model that encompasses all the centralities.

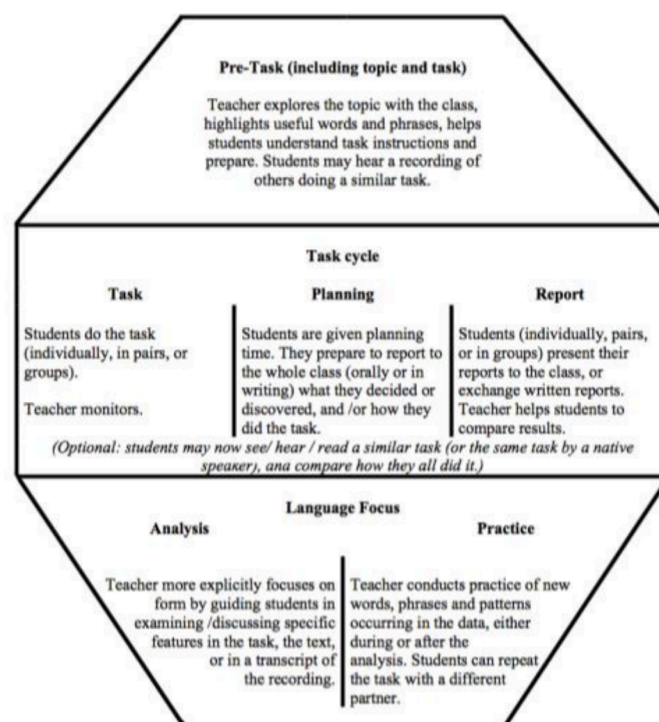


Figure 2: Task-Based Language Learning Model - Willis (1996)

The post-task stage provides a prospect to students for practising language inside and outside the classroom. During this phase, students produce artefacts that are administered by teachers and students' performance is recorded. This gives guidance to students for improvement in the task. For task finalization, out of class task activities have to be brought back into the class to offer reflection and discussion to complete the task (Burston, 2015). Post-task when carefully designed leads to assessments in the classrooms that have to be flexible and diverse corresponding to different student needs. Learners have to be evaluated based on their assimilated information, linguistic development and overall task performance (Xue, 2020). Technology affordance at this stage is the development of linguistic and non-linguistic skills that may lead to life-long learning outside the classroom. Moreover, self and peer-evaluation can be encouraged at this stage based on the teacher's feedback. This is an imperative stage for teachers to reflect on their resources, teaching practices and learning process.

Technology integration in the post-task stage can be based on short online assessments with applications like Kahoot, Quizizz, Mindmaps, Microsoft Forms etc. Formative assessments in online reading platforms can utilize the built-in feature of assessment that provides automated feedback to learners. FlipGrid can be used to encourage students to produce videos collaboratively and assists in students' communication. BookWidgets provides teachers with a wide opportunity of task-based questions which can be based on reading, writing short answers, matching, multiple-choice questions which can help in task repetition and analysis. Online real-time discussions with teachers using video tools allow students to reflect and regulate. This improves their fluency and accuracy in the target language. Online polls are

one such helpful tool that enables the teacher to record students' responses on their learning experiences and teachers can self-reflect.

Based on the above findings on technology-mediated TBLT and about the impetus for technology in task-based learning, the author has attempted to reach a consensus by integrating CALL and TBLT model and materialize a new conceptual model that consolidates the assistances of both approaches.

### Proposed Conceptual Model

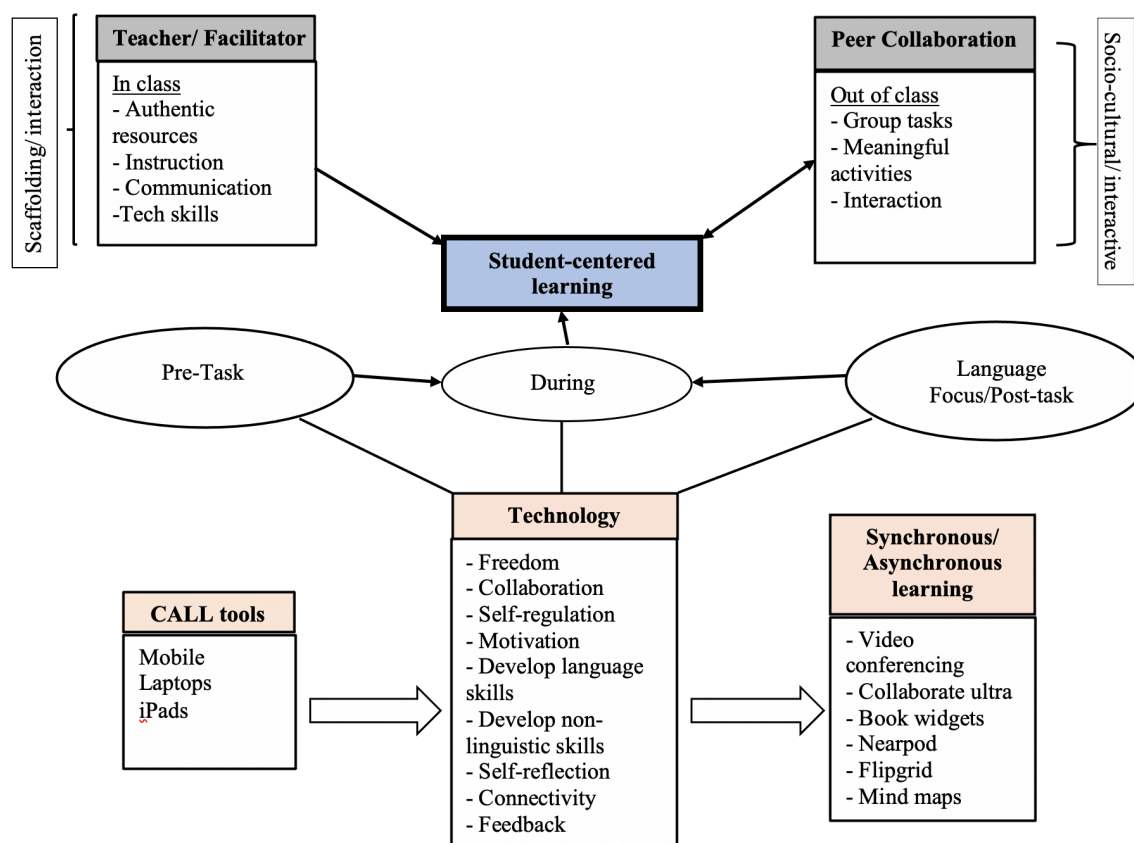


Figure 3: CALL - TBLT Integrated Model

### Conclusion

This research provides a baseline to further researches in the domain of technology mediation in TBLT. Several studies have indicated the positive influence of technology in classroom instruction that encouraged student participation, reduced cognitive burden and provided educators with opportunities to explore the diversity and individualized instruction that technology has to offer. The developmental benefits have also been attributed to the TBLT framework by providing a sound and flexible framework that motivates the learners. The conceptual model proposed in this study is reckoned to be in the centre of the paradigm to construct linguistic knowledge based on the constructivist and sociocultural theories. The teachers' pedagogical role is of paramount importance as they are the designers of the tasks. Although technology provides a congenial environment to learning, its implementation is still not void of challenges. Teachers' readiness and knowledge in the use of technology in the classrooms cannot be overlooked. Moreover, students' enthusiasm in technology-mediation

can be built only if they are ardent users of technological tools. CALL has provided a multimodal concept of learning where learners enjoy greater autonomy, however, learners positive attitude and other novel skills like digital literacy, communicative and intercultural competence (Xue, 2020) are of much importance. The balance in the development of linguistic and non-linguistic skills is of utmost importance and it is teachers' role to be selective and discrete in the choice of tech tools. The teacher has to act like a facilitator to raise awareness, model tasks, monitor students' performance and conduct follow-up activities. It must also be noted that context and culture play a vital role in task selection and its completion. Further research needs to be conducted including technology as a part of language curriculum, syllabus and instruction. The research urges stakeholders to invest in appropriate software that are beneficial in language acquisition. This research also sets a stone in ESL literature by providing an integrated model which had not been established thus far.

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***A Narrative Inquiry of Coping Responses of Selected Deaf College Students in the Philippines During the COVID-19 Pandemic***

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**Abstract**

COVID-19 made an immense impact on the educational system worldwide. The unexpected disruption of face-to-face instructions and the sudden change in the academic curriculum stressed the learning and well-being of Deaf students. However, during the pandemic, their voices were primarily unheard. Therefore, this study aimed to determine the coping responses of selected Deaf college students in the Philippines during the COVID-19 pandemic. This qualitative study employed a narrative inquiry method through in-depth interviews and conversations. Convenient purposive sampling was used to identify the participants. The instrument was a customized interview questionnaire, developed through the guidance of Special Education professors and pilot tested with students with similar interests as those who participated in the research. The transcript was examined, coded, and categorized. Four themes emerged: *overwhelming feelings*, *managing time and responsibility*, *conveying the message*, and *nurturing faith in God*, categorized into reaction, reality, request, and response, analyzed and interpreted using attribution and self-determination theories. The situation during COVID-19 brought overwhelming feelings to Deaf students. To convey their message, especially to their non-signing families, was challenging. However, this situation motivated them to manage their time and responsibilities at home and online schoolwork. Through family support, they accepted and understood the reality of the pandemic. It also opened an opportunity to nurture their faith in God. Further research exploring more profoundly deaf spirituality, resilience, well-being, and coping needs is recommended to give voices to the Deaf, especially during unexpected difficult circumstances.

**Keywords:** Coping Responses, Deaf College Students, COVID-19 Pandemic, Narrative Inquiry

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## Introduction

COVID-19 made an immense impact on the educational system worldwide. Unfortunately, people With Disabilities (PWD) are highly affected in times of drastic and unintended changes (Gleason et al., 2020). The unexpected disruption of face-to-face instructions and the sudden change in the academic curriculum stressed the learning and well-being of Deaf students. In addition, school closure brought hardship, fear, and frustration, leading to unprecedented hazards to students' mental health (Xiong et al., 2020). Sadly, their voices were primarily unheard. Nevertheless, the challenges brought by the COVID-19 pandemic in their lives must not be overlooked (Goenner, 2021) because despite their disabilities, they, too, are significant members of society.

With COVID-19, isolation became more complicated for students whose family members did not know how to sign and could not help their Deaf kids in their school work. Although some parents knew how to sign, they needed to work daily. As a result, their Deaf children were left alone at home with no one to help them in their online learning. Thus, the emotional challenges that many Deaf students experienced during the pandemic brought immense uncertainty. Their feelings of self-doubt and inferiority put them in a disadvantageous position (Dianito et al., 2021). Consequently, they feel neglected, which affects their well-being and learning.

Many educational disparities hinder health knowledge and the ability to make informed choices (Kutina, 2020). Mitigating the consequences of academic discrepancy will significantly benefit interdisciplinary, interpersonal, and clinical strategies (Campos & Launer, 2020) and improve academic performance (Alshutwi et al., 2021). Thus, policymakers and practitioners should advocate developing unique designs for Deaf students. In addition, Albertini et al. (2012) underscored that personal factors could play a significant role in their academic success. For example, a suitable home environment and parents' positive attitude affect their academic achievement (Wanjiru, 2014). For Daliborka & Boško (2021), there is a difference in their academic successes if active organizations support them.

The marginalization and exclusion of Deaf students have long been an issue and heightened during the COVID-19 pandemic. Their stories need to be heard to bring greater awareness of their feelings and open more conversations to improve the services they need. Therefore, this study sought to answer how the COVID-19 pandemic impacted the learning and well-being of Deaf college students and how they cope with the changes brought about by the pandemic.

## Communication Barriers

One of the most crucial issues for Deaf people is communication problems because they can often not interact with peers and adults (Pasandideh & Keramat, 2020). The significant communication barriers for the deaf during the COVID-19 pandemic that has impacted their learning and well-being require various forms of ongoing support from both their families and schools to ensure that they succeed and benefit from their experiences (Alqraini & Alasim, 2021). Moreover, they have more emotional, educational, and behavioral communication issues (Shalani et al., 2018). For example, most Deaf students expressed their longing for the implementation of teaching and learning in the physical classroom (Zaid, 2021) because the inability of their family members to help them in their understanding detached them from their usual physical undertaking in school. Further, receiving health information contributed to the significant gaps in health literacy. For example, adults who

are deaf were 4.7 times more likely to report difficulty understanding COVID-19 information (Panko et al., 2021). Also, the intelligibility of sign language expressions used on TV or video is unclear or not understandable to the Deaf. Therefore, new terms like COVID-19 and coronavirus needed sign language to be created and used to present the risks and coping mechanisms to the Deaf community (Amorim et al., 2020).

The Deaf community gains access to the technical language for communication and coordination care through sign language. However, the disadvantages of the lack of information in sign language about coronavirus to the Deaf community have confused and resulted in information gaps (Zaid, 2021) and caused panic and stress.

Communication plays an integral part in the lives of the deaf during the COVID-19 pandemic. However, the lack of skill in communicating effectively with them left them isolated. As a result, students felt the need to go to school where they could feel community because they could openly express themselves.

### **Coping Responses**

Coping means the cognitive and behavioral strategies to control or manage situations evaluated as stressful (Enns et al., 2018). Coping works the immediate problem with the surrounding environment causing distress and regulating the emotional response to the stress problem (Russo, 2019). Stress is an imminent aspect of the human experience. It is an expression of psychological distress that results from societal pressures that exceed the individual's coping capacity (Ebigbo et al., 2015).

A person's stress level depends on cognitive evaluation, appraisal, and coping (O'Brien et al., 2012). The concept of appraisal refers to a primary evaluation process made by the person when facing an event. When a person considers a situation a threat to their well-being, they make a second appraisal evaluation to assess the coping options available to deal with it (Enns et al., 2018).

However, coping makes a big difference in the adaptation process. Coping is a process that people use to assist them in dealing with stressful stimuli from the environment (Roy, 2011). Innate or natural coping processes are automatic processes that are unintentional, involuntary, effortless, and occur without the person's awareness (Roy, 2014). Moreover, acquired coping processes are developed and learned through deliberate and conscious actions.

How Deaf students cope with everyday stressors are dependent on their environment. They find less stress with people close to them and people they can trust. Conversely, significant coping issues result in a situation not sensitive to people's disabilities.

### **Deaf Experiences**

The negative stereotypes and prejudices on Deaf people held by society and self-stigmatization that often develops within them who are the target of social stigmatization hurt their physical and psychological well-being and participation in activities of daily living (Gagné et al., 2009). How society behaves, shares assumptions, or institutionalizes priorities shows how they value people. Sometimes, "differences in terminology are not inconsistencies but often indicate deliberate choices and perspectives" (Young & Temple, 2014, p. 12). For example, the "d" of Deaf should be capitalized to Deaf when referring to

individuals who use sign language and, at the same time, are part of the community of Deaf (Woodward, 1975). Thus, being Deaf was marked as a linguistic and cultural identity in “the same way as we would mark Polish, English or Persian with a capital first letter” (Young & Temple, 2014, p. 14). Thus, deafness is objectified; it allows it to be talked about as something that happens to people instead of being part of them (Gascon & Ramos et al., 2010). The use of language creates meaning based on people's attitudes and society's stigmatization. The lifestyle standards of the general hearing population have, at times, ostracized and overlooked the unique needs of the Deaf community (Sommer, 2020). In the same way, it risks those with hearing loss becoming increasingly isolated, and the lack of support has been one of the most complex challenges they faced during the pandemic (Grote & Izagarea, 2020).

These challenging experiences of the Deaf college students led the researchers to explore their coping responses during the COVID-19 pandemic in the Philippines. Most Deaf students studying in the city returned to their provinces when the lockdown and closure of schools started. However, it became more difficult to sustain their studies because of the lack of resources and the signing households. Also, they feel burdened with their family because things need to be interpreted to understand what is happening around them.

COVID-19 reshaped society and, consequently, access for the Deaf people who relied on seeing mouths and facial cues to communicate. It rendered them vulnerable in ways they were unprepared for and concerned about (Kersten-Parrish, 2021). Nevertheless, their narrative is vital as often their needs fell on deaf ears of people who are supposed to aid them during the pandemic.

## Results and Discussion

The researchers used researcher-made interview questions with six participants (P), thus purposive sampling. The transcribed data identified codes, categories, patterns, and themes (Kim, 2016). As a result, four themes emerged: *overwhelming feelings, managing time and responsibility, conveying the message, and nurturing faith in God*. These themes were categorized into reaction, reality, request, and response. The researchers employed attribution and self-determination theories to guide and interpret the study results.

The Attribution Theory originated from psychologist Austrian philosopher Fritz Heider (1946). In their book, Edward Deci and Richard Ryan introduced the Self-Determination Theory and intrinsic motivation in human behavior (Deci & Ryan, 1985). Harold Kelly and Bernard Weiner further advanced this theory. Fritz Heider recognized attribution as a central process of forming subjective interpretations of the world (Malle & Korman, 2013). The theory of attribution deals with how individuals perceive the causes of everyday experience as being either external or internal (Kassin & Markus, 2016). It is the people's perception of what causes the situation (Crittenden, 1989). Explaining an event constitutes an answer to why the event happened. According to Heider, to understand and control the world around them, the events in people's lives are interpreted using consistent and logical modes of sense-making (Manusov & Spitzberg, 2008). One way of expanding the event is by stating what caused the event (Jaspars et al., 1983). It may be caused by factors outside the person's control (external) or perceived as the person's internal (Ryan & Connell, 1989). Understanding the causality opens opportunities to better understand and motivate an individual in specific tasks by increasing autonomy, relatedness, and competence (Turban et al., 2007). As a result, this leads to the self-determination theory. Self-Determination Theory

focuses on the influence of social environments on attitudes, values, motivation, and behavior (Deci & Ryan, 2010) that foster voluntary forms of motivation (Leung, 2019). These are essential for optimal natural disposition, constructive social development, and personal well-being (Ryan & Deci, 2000). Its arena is the investigation of people's psychological needs that are the basis of self-determination.

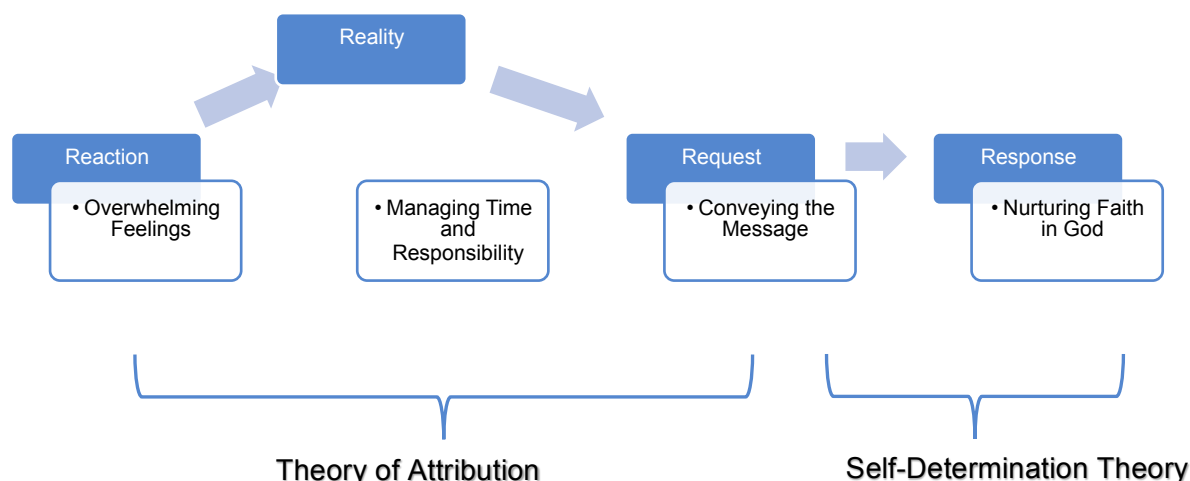


Figure 1: Theoretical Framework

*Note.* Employing the theories of attribution and self-determination in analyzing themes and categories

### Unpacking Stories of Participants (P)

The following were the themes drawn from the narrative analysis of data to interpret the participants' meanings of themselves, their surroundings, their lives, and their lived experiences (Kim, 2016). First, analysis implies objectivity, and interpretation implies subjectivity. As researchers, we analyzed what was said, giving evidence for the interpretation (Chase, 2003).

#### Reaction: Overwhelming Feelings

The situation during the pandemic was hard to deal with. As a result, it brought feelings of stress, anxiety, and boredom. As P1 said, "All I have to do is stay at home. As if I could not breathe, I felt sick; there was no exercise, and I got bored." When the government imposed a lockdown, and the schools were closed, the participants were not ready for the situation. Their activities were interrupted, and their routines were challenging to sustain.

Similarly, P2 also experienced the same feelings. He said, "I felt terrible, like a weird feeling. I become hard-headed. I do not have enough sleep and exercise." P3 also felt shocked. He said, "I panicked because I did not expect a pandemic. So, I stayed in the house. Then, I panicked again because, up to now, the virus is still here." Finally, for P4, he expressed that he felt depressed. He said, "Because of COVID-19, I was depressed. It was challenging because I always stayed home, feeling bored and unable to communicate with my

family, and my mind became stagnant. I am sad and sometimes frustrated and overthinking of myself.”

For P5, her aunt's death during COVID made her angry. She said, "I was angry and experienced depression, especially when my aunt died. However, she cared for me and has always been with me in school. Because I am not ready to lose her." P5 added, "Sometimes, there is trauma because I cannot go out. However, nevertheless, I also see many deaths, which is very depressing.”

During the lockdown, many questions also emerged: Why does COVID happen? What will we do? Are we going to look for work? However, how could that be if there is COVID? So how can we budget our expenses? These were mind-boggling situations that contributed to the participants' emotional reactions.

### **Reality: Managing Time and Responsibilities**

The sudden disruption of classes and prohibition of social interactions resulted in difficulty organizing and planning activities. The participants were unprepared socially, emotionally, and academically. However, they found ways to manage their time and responsibilities. "I schedule going to the Church on Sunday, even nighttime," P1 said. Moreover, she also redirected her anxieties by writing a journal. She recounted, "Since we cannot go out, I write a journal about my experiences. Then I go to the Church because I want to move." Likewise, in doing her schoolwork, she managed to complete her assignments. "I make it a point that I accomplish my tasks. If there is no internet, I find ways to connect. I am also a member of an organization, so I do schoolwork and org work." P1 said. P4 also finds time to balance his time. He said, "I balance my work assignments, and usually, I do all my schoolwork at night.”

For P3, no time is left wasted. He expressed, "I looked for ways to earn money. I sold different goods." He is also committed to his academic work. He said, "My assignments and their deadlines are essential. I must finish them early." He would lessen his stress when he felt overwhelmed with his assignments by ensuring he accomplished his academic requirements. Similarly, P4 said, "If I am depressed, I walk around the house and just keep silent about it.”

Likewise, P2 would go to his province. "I go out sometimes, go to the province, go swimming with my friends if there is an opportunity. There are changes and processes during the pandemic. I do it step by step. I also take care of myself and the people around me." P2 shared.

Through the lens of attribution theory, the participant's understanding of the realities of the pandemic opened opportunities to motivate them better to be more responsible for their time. Attribution theory explains how people interpret and react to causes of events (Weiner, 1985). Perceived responsibility is central to this model (Weiner, 2006). As P6 said, "I balanced my time in my academics. I always check the deadlines of my assignments. I learned these skills during the pandemic." P5 also shared that she never goes with her mother to buy stuff at home, but the pandemic taught her to help her mom buy what they need at home". It was hard for P4 to balance his responsibilities at home and school during COVID, but he improved his work at school and home because the pandemic is already two years. The participants have not wasted time because they did not know when the pandemic would



end. On the contrary, the situation motivated participants to do their responsibilities at home and school.

### **Request: Conveying the Message**

To be understood by someone was challenging for the Deaf participants because their family members were not skilled in using sign language. P1 said, “My family members are not signing. They only use gestures, especially my parents. But I have a sister, and she is also deaf, so we understand each other well”. P1 expressed how difficult it was to communicate with her mother and father.

For many Deaf children, fitting into the hearing world is difficult (Harmon, 2013). As a result, they struggle to fit into their parents' culture (Hamilton & Clark, 2020). P3 shared, “It is challenging for my parents to sign. Since they are working, they no longer have time to learn sign language. They are already old, so it is difficult to learn sign language”. He also said that his parents communicated with him orally. He reads their message through lip-reading.

For the participants who rely on lip-reading, wearing masks prevented them from reading the conversation. P4 shared his difficulty communicating with people wearing masks while selling goods during COVID. He said, “We have a small business. I sell goods to save money when I go back to school, but it is difficult to communicate with customers wearing masks.”

P2's family is hearing and uses fingerspelling when they communicate with him. However, he said there is often miscommunication in the family because their message is unclear. P2 said he would just go to his room or leave the house. He feels depressed when his family does not understand him and hopes to learn to sign.

Deaf participants would easily express themselves with their friends or classmates through video conferencing. As P4 said, “I find school activities hard to understand, especially the word instructions in the assignment. I prefer to ask my friends rather than my family or sister because of difficulty in communication. I get answers immediately with them, rather than with my family.” Conversely, P5 kept silent, feeling frustrated when she could not fully express herself to her family, who were not signing.

Although it was challenging for the participants to communicate with their families because they were not signing, they were grateful for the support and love of their families. They accepted that they could not wholly share with them using sign language. However, they were assured of their love and support, especially during the pandemic. They would sacrifice work to provide for their basic needs while studying from home. P3 said, “My father does not have any time to learn sign language, and I accepted that. My father needed to sleep early and work the next day. That is how he loves his family”.

Attribution theory's heart is the affirmation people continuously pursue to explain events they encounter (Graham, 2020). The struggle to communicate with hearing family members is a continuous challenge for deaf people. However, they maintain a strong connection among family members during the pandemic amid this difficulty.

## **Response: Nurturing Faith in God**

The pandemic made the participants more aware of their relationship with God. God's presence was felt through their communion in prayer. It gave them the space to communicate with Him bringing their questions, fears, and hopes. This aspect of their lives allowed them to reflect on the situation they could not control. Their faith in God motivated them to hope for a COVID-free tomorrow.

## **Conclusion**

The narrative of the coping responses of Deaf college students during the COVID-19 pandemic in the Philippines has uncovered different realities of weakness and vulnerability that resulted in pain, loneliness, and isolation. However, it also brought joy and assurance, knowing they were never alone in their struggle.

Communication has always been a significant barrier restricting the Deaf from conveying their message. However, during the COVID-19 pandemic, where all students were in remote learning, the lack of family members' training on sign language caused so much harm to the Deaf students' well-being. The inability to express their feelings and thoughts resulted in a more profound silence that only they could understand. It was a lonely experience knowing they were in their own homes with their loved ones.

The scenarios of death, unemployment, and financial crises increased anxiety and depression. In addition, the struggle to connect with schoolmates, teachers, and friends was challenging. Deaf participants could not grapple with what they saw and experienced. However, the love and support that they received from their families wiped out their suffering. Despite the silence, they dealt with the challenges of the pandemic together. Although their family members may not be competently communicating with them using their language, they have also demonstrated their love and support for them. Moreover, their faith in God gave them hope to continue living. For them, God is a friend, a mother, and a companion, assuring them that He listens to them.

The stories of the Deaf students call for a more charitable attitude and solidarity with them. It is a reminder that everyone is valuable and that their voices are essential, no matter how silent it is.

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***Impact of Proficiency in English on the Intuitive Understanding of  
Computer Science Concepts***

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**Abstract**

Computer science terms like: Code, Analysis, Protocol, Encapsulation, Validation, Sampling, Model and many more are borrowed from English with their meanings slightly altered to suite computer science. This makes initial computer science acquiring more difficult for non-native English students, while it is facilitated for students of higher English proficiency. This is sort of a transfer from language proficiency to computer science which is similar to the known concept of transfer from one language to another in new language acquisition. The paper presents a test for assessing this transfer by investigating students' understanding of selected terms in both technical and non-technical contexts. The terms were selected to represent computer science sub-concepts as defined in the literature; hence, students' understanding of these terms in everyday non-technical uses, measures potential students' understanding of these same terms in computer science technical uses. The test was applied on Arabic speaking students of different English proficiency and different maturity levels. It was found that the intuitive understanding of the terms in computer science improves with improved English, but no impact of maturity was found. Computer science students' records revealed an association between computer science learning and English level which is attributed partially to this transfer.

**Keywords:** Computer Science Education, Language and Education, Language Transfer

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## 1. Introduction

Al-Nasser (2015) describes the outcomes of English language acquisition of school leavers in Saudi Arabia: “after studying English for about 9 years, school leavers are, in most cases, unable to speak or write a single flawless sentence in English.”. Meanwhile, in Albaha University in Saudi Arabia, English is the language used to teach computer science (CS). Therefore, this presents a challenge to inducing an effective teaching-learning process in CS.

Interrelationship between English proficiency and computer science learning is an underdeveloped problem in literature. Most research focus on programming difficulties and the errors committed by novice programmers attributed to language in addition to other factors of math and algebra (Clancy, 2004; Ebrahimi, 1994; Jackson, Cobb, & Carver, 2005; Miller, 2014, 2016).

In a previous paper (Aldmour & Nylen, 2014), it was proposed that proficiency in English and the corresponding culture can lead to an intuitive initial understanding of CS terms and concepts. It was a work in progress paper which proposed also the methodology used here to test this dependence. The actual testing was conducted at later times with results presented in this paper.

The approach here is to look at the problem as a transfer from language (English) to CS that is in favor of native English speakers but may impede the learning of non-native English speakers. This is similar to the transfer occurring from the knowledge of one language (L1) to the learning of a second language (L2) in second language acquisition (SLA) concept in linguistics. A test is designed to measure transfer from English to CS similar to testing transfer from L1 to L2 in SLA. The test was applied to native Arab students of different proficiency levels in English. Test results were analyzed to investigate if a connection between the proficiency in English and the intuitive understanding of computer science terms and corresponding concepts exists. The connection (if existing) will be of great value as it sheds light on how non-native English students initially understand computer science terms, which may contribute to learning the concepts and the related CS tasks.

Additionally, knowing that a connection like this exists, it can provide basis for designing English courses for a specific purpose of enhancing learning and teaching in CS of non-native English speakers. This is similar to the recommendations in (Nation, 2003) about the importance of communicating meaning and respecting the role of the first language in foreign language learning.

## 2. Background

### 2.1 Culture, Language and Learning

Most important forms of human cognitive activity develop through interaction within social and material environments, including conditions found in instructional settings (Burgstahler, 2011). Lee (2005) assures that “Learning is enhanced—indeed, made possible—when it occurs in contexts that are culturally, linguistically, and cognitively meaningful and relevant to students”. For students studying in another language with the associated culture, home languages and cultures encompass the tools that students use to construct their understandings of the world. “L1 provides a familiar and effective way of quickly getting to grips with the meaning and content of what needs to be used in the L2” (Nation, 2003). Many research



works on students learning CS or other disciplines (Tobin & McRobbie, 1996; Tenenbergs & Knobelsdorf, 2014; Lee, 2005) assert the role of students' cultural-environment and prior linguistic knowledge factors for limited English proficiency learners. More specifically, in the domain of CS teaching, Zendler, Spannagel, & Klaudt (2011) say that computer science curricula must not be based on fashions and trends, but on contents and processes that are, among other factors, related to everyday language and/or thinking.

Hence, any previous conceptual understanding gained using mother's language and culture, e.g. Arabic, will have to be recalled even if the language medium is different, e.g. English. This is especially true for those concepts that are linguistically or culturally related to science concepts and terms. Therefore, it is natural to conclude that learning can be more effective if the learners were developed or trained to obtain everyday English language and cultural meanings in a way similar to native English learners; i.e. they become more fluent in English and its culture.

Naturally, the terms and concepts of high importance in this mechanism will be those contributing toward learning the basic concepts of the discipline studied. Henceforth, central (basic) concepts in CS are next discussed.

## 2.2 Central Concepts in CS

Zendler and Spannagel (2008) determined the basic concepts in CS by surveying CS experts' opinions of what concepts are CS centrals. This results in a catalogue which classifies the central concepts in CS into 15 central concepts. These are namely: problem, data, computer, test, algorithm, process, system, information, language, communication, software, program, computation, structure, and model.

Zendler and Spannagel central concepts are of a wide nature spanning across the different CS subjects. They also represents what to be acquired by the students (e.g. upon completing the curriculum). Zendler and Spannagel also recommended that the central concepts have to be specified in more detail; i.e. subconcepts. For example, course specific concepts, called concept inventories (CI), to be used to asses gain on course level are obtained in (Goldman et al., 2010) for three introductory computing subjects: discrete mathematics, programming fundamentals, and logic design. In obtaining the CIs, they also followed an empirical approach that is based on Delphi process for collecting information and reaching consensus in a group of experts.

Hence, computer terms (to be used in the test described later in the paper) are selected to represent subconcepts (or concept inventories) which can be classified under the 15 central concepts. Moreover, any of the terms selected has to represent a similar concept (have similar meanings) outside the CS discipline in everyday language. Understanding these terms in a computing context is therefore a measure of understanding of the wider central CS concepts.

This relation between language and CS terms and concepts is further exemplified by making reference to the second language acquisition concept and related language transfer phenomena as outlined in the coming section.

## 2.3 Language (to language) transfer and Language to CS transfer

The influence of English on learning computer science can, somehow, be looked at as if we look at the impact of knowing one language (first one) on the learning of a second language in what is called second language acquisition (SLA). In this analogy, the first language is English (as it is the medium of instruction) while the second language is computer science. In SLA, language transfer occurs when the second (new) language learning is influenced by the previously known language(s) (Zhai, 2012). Transfer is defined in (Ringbom & Jarvis, 2009) as the learners' reliance on perceived and assumed cross-linguistic similarities and it can be manifested at three different levels: item transfer (e.g., sound, morpheme, word, phrase), system transfer or procedural transfer (word forms and order), and overall transfer.

Effect of L1 on L2 learning is limited when considering L1 formal features, but it will be pervasive when considering L1 meanings (Lantolf, Thorne, & Poehner, 2015). This is in line with our work as it emphasizes the effect of meanings.

Computer science courses are mainly written in English and they utilize the readers' familiarity with the corresponding culture. Computer science terms generally originate in English and many computer science terms and concepts are English words for more or less similar everyday's phenomena. Examples are: handshaking, protocol, procedure, syntax, validation and piggybacking. A CS student who first encounters such terms in his CS studies can immediately build an intuitive initial understanding of their possible meanings and usages in the discipline provided that he/she is aware of their everyday English meanings and usages.

As language exists before CS, we view this relevance, as a kind of transfer. Let this transfer be denoted as Language (English) to Computer Science (L-CS) transfer. In this paper, we seek to investigate whether the students' proficiency in English and its culture influence their intuitive understanding of CS terms and concepts.

## 3. The Test

### 3.1. The Role of the Test and its Basis

In this section, we proceed to the test. It is designed to test students' intuitive understanding of selected terms in computer science and to correlate this with their knowledge of their corresponding meanings and usages in everyday English. The selected terms are assured to represent subconcepts in CS; hence, knowledge of their meanings in CS context is some indicator of intuitive understanding of CS concepts. Also, knowledge of their English meanings is some indicator of the students' proficiency level in English. Both levels are only indicators and are not meant to be professional English and/or CS proficiency level tests.

We argue that if any intuitive understanding of CS concepts existed in students subjected to the test, it is attributed to the impact of English on CS; i.e. English is the causal factor in this association. Consequently, the test is to be used only on students with no knowledge in computer science, so that the understanding they may show on the test is an intuitive one attributed to their understanding of the terms based on their language background. Also, other factors impacting students' knowledge of CS concepts, beside their English level, are isolated (as described later). The test is not to find about the impact on CS learning or on the final

understanding of CS concepts. After all, other factors; e.g. enhanced pedagogy, may overcome initial difficulties.

Using language transfer concept terms from linguistics, the test will detect whether knowledge of English results in a positive transfer to Saudi students' ability to get meanings from unfamiliar computer science terms and concepts. Specifically, it tests the ability to infer meanings and usages of terms which are of bi-use in both everyday English and in computer science.

### **3.2. Characteristics of the Test Groups**

In our test, we have test groups to compare that have different English proficiency levels but can be roughly considered equivalent on all other factors. Also, as other factors of age and the extent of previous studies have an impact on language transfer in second language acquisition (Chamot, 2004; Nikolov & Djigunović, 2006; Raheem, 2018; Zhai, 2012), it is reasonable to assume that maturity is also a factor in L-CS transfer. Students of the same level of study are considered of the same maturity level (as level of study combines both age and the extent of previous studies).

Groups of Saudi students at two different levels of maturity and at two different levels of proficiency in English, all with little knowledge in computer science, are compared. Basically, these groups were drawn from different majors and grades at the university, henceforth, with regard to maturity and English level we expect that each group which is of the same study area and the same level of study to be homogeneous with regard to maturity and English level.

However, individuals in any group may perform differently on the test due to other factors out of our control. Examples of these factors that we thought about are students with special extracurricular training in computer science, students with special past experience, e.g. students who lived outside the country for some period and students who received special English training different to others. Those students were excluded from the test. Also, university *GPA* and secondary school average (*SSA*) might contribute to an underlying aptitude towards both English and computing concepts; i.e. confounding variables. Hence, Efforts were exerted as well in order to rule out the effect of such confounding variables.

### **3.3. The Test Parts**

The test is composed of two parts. In the first part, the students are asked to provide general information about themselves such as age, field of study, level of study, status of study, year of enrollment, accomplished credit hours so far and *GPA* (or *SSA*). As well, students who changed major, repeating students, students who are over aged, and students of exceptional *GPA*, were all pinpointed and excluded. Students were also asked to assess the level of their knowledge in computer science (novice user, intermediate, and programmer) and to provide information regarding any special training courses on computers, IT, programming, CS and English, and whether they had been abroad for some prolonged time. We used this information to exclude the test results of students who appear to be different to the rest of the group in a way which may impact their classification as students of a certain homogeneous group. Moreover, no group is created with student studying CS or a related area.

The second part of the test assesses the students' understanding of English words, both in their everyday use and in their use as computer science terms. Since the students are not expected to have prior knowledge in computer science, they are asked to use their intuitive understanding of the word to infer the computer science term meaning(s). For this part, 30 terms in CS are selected. Each one of them is classified as a subconcept under one of the 15 CS central concepts. The terms that are used in the test are purposefully chosen to be of bi-use in nature. For example, the term Syntax means, in everyday language, “The order, vocabulary and rules in which the words forming sentences and phrases, in human languages, come”. In computer science the term Syntax is linked with the basic concept of Language whereby particular programming language syntax refers to order, spelling and rules with which the vocabulary, symbols and variables must have in a program depending on the programming language itself. Hence, ingredients and role of Syntax in English are almost the same ingredients and role of syntax in CS programming languages. It is therefore expected that students aware of Syntax meaning(s) in English will be able to infer its extended meaning(s) within computer languages concept.

#	CS Concept	CS Term	#	CS Concept	CS Term
1	Problem	---	9	Language	Procedural, Syntax
2	Data	Abstraction, Encapsulation, Representation, Validation, Verification	10	Communication	Protocol
3	Computer	Logic, Proxy	11	Software	Analysis, Interface
4	Test	Reliability	12	Program	Code, Control
5	Algorithm	Aloha, Piggybacking, Round-Robin	13	Computation	---
6	Process	Batch, Bootstrapping, Pipelining, Sampling	14	Structure	Substrate
7	System	Combinational, Embedded, Timesharing	15	Model	Imperative, Simulation, Synthesis
8	Information	Non-repudiation			

Table1: CS terms used in the test and the concepts they are linked to.

Aldmour & Nylen (2014) initially selected some terms, classified them based on their experience, and asked a number of colleagues in the field to review the initially selected terms and their classification and to suggest other terms that they may find more appropriate as subconcepts. A list is finalized as shown in Table 1 (Aldmour & Nylen, 2014). The table lists 30 terms together with the concepts that they are linked with, e.g. Code is linked with the Program concept, Abstraction with Data and Syntax with Language.

The second part of the test contains 30 test questions, one for each term. In any question, the student is given the first translation shown by Google Translate ([translate. Google. com](https://translate.google.com)). The translation is given because we assume that the student will use some kind of quick translator in his studies. Each question is composed of a question sentence giving the term (and its translation) followed by two columns. Left column lists four options of everyday meanings, two of them are correct. Right column also lists four options of CS meanings with two options correct as well. The different answers are also given in Arabic as we target to test understanding only.

Table 2 shows how the term Syntax appears in the test (in English) as an example (correct answers given). The students were instructed to tick two correct answers from the four options in each column. The test answers are marked and analyzed as described below.

Choose the 2 correct meanings (left col.) that comes to mind for the term “Syntax” (التركيب) in normal English.	Choose the 2 correct meanings (right col.) you expect for the term “Syntax” in computer science
Meanings and vocabulary connotations which form sentences and phrases <input type="checkbox"/>	Vocabulary, symbols and variables have particular order which depends on the programming language <input checked="" type="checkbox"/>
The order in which the words forming sentences and phrases come. <input checked="" type="checkbox"/>	Software lines define processes implemented by the computer needs to know <input type="checkbox"/>
Paragraphs consist of words and words consist of letters <input checked="" type="checkbox"/>	Each programming language has basic vocabulary set that the programmer has to know. <input type="checkbox"/>
The vocabulary of different languages <input type="checkbox"/>	The program consists of lines and the lines of words, symbols and variables. <input checked="" type="checkbox"/>

Table.2: Example of a question from the test.

#### 4. Applying and Analyzing the Test Results

The test was applied on students of Albaha University in Saudi Arabia. It was first applied on a small group of students for validity and stability purposes and to ensure that the level of difficulty is appropriate. After adjustments, the test was applied to three different groups of students defined as follows:

- Group 1: This group is the group of high maturity and low English level (HL Group). The group consists of final year students in an area other than English and computer science, who study mainly in Arabic. Students in this group were selected to be Year 4 students with Arabic literature as their major.
- Group 2: This group is the group of both high maturity and high English level (HH Group). The group members were selected from Year 4 English literature and Year 4 business students who study mainly in English.
- Group 3: a group of first year students who only know English as a second language at secondary school level. This group represents the low maturity and low English (LL Group) level students.

Students in Group 2 (HH) are expected to have significantly more knowledge of English (Proficient level) than the students in groups 1 and 3 (Primitive level). Hence, any significant difference the test reveals between group 1 (HL) and group 2 (HH) that is favoring group 2 could be attributed to their higher level of English and could be an evidence of L-CS transfer.

Also, students in group 1 (HL) and group 2 (HH), the two senior level groups different only in English proficiency, are expected to be more mature than students of group 3 (LL Group of

Year 1). The purpose of testing group 3 is to compare their results to those of group 1 to be able to investigate the impact of maturity on L-CS transfer.

To quantify the transfer, the following two measures are first defined:

- Every Day English Proficiency (*EDEP*: score out of 60): Calculated as the sum score of the scores of the 30 terms on the left column (Everyday English meanings) with every term has 2 correct answers, hence, scored 0,1,or 2.
- Computer Science Concepts Understanding (*CSCU*: score out of 60): Calculated as the sum score of the scores of the 30 terms on the right column (CS meanings) with every term also has two correct answers, hence, scored 0,1,or 2.

A positive measure of transfer (*TR*) is then defined as the correct *CSCU* per correct *EDEP* per question (test item).

Notice that we elected not to classify the occurrence of negative transfer (if any) as negative transfer, or interference. This is following (Ringbom & Jarvis, 2009) in their linguistic study where they elected to describe this occurrence as the absence of relevant concrete (positive) transfer.

Table 3 shows how we defined the *TR* measure. In the table, the extra correct *CSCU* answers compared to *EDEP* answers (Cases A and D) are attributed to randomness, hence, they are not considered a transfer. Conversely, in cases E and F, *EDEP* is greater than *CSCU*, hence, there is no transfer in Case E ( $TR=0$ , students scored 2 correct in *EDEP* resulted in no correct *CSCU*) or partial transfer ( $TR=1$ ) occurred only in case F (2 resulted in 1 only). The Hit (Case G), represents the case of a student knowing the two everyday language meanings (two correct *EDEP*) resulting in two corresponding correct *CSCU* answers.

Case	<i>EDEP</i>	<i>CSCU</i>	<i>TR</i>	Note
A	0	0, 1, 2	0	No transfer
B	1	0	0	No transfer
C	1	1	1	Transfer of 1
D	1	2	1	Transfer of 1
E	2	0	0	No transfer
F	2	1	1	Transfer of 1
G	2	2	2	Hit (transfer of 2)

Table.3: Positive transfer (*TR*) definition.

To assess the results of each group in inferring correct CS concepts from their English knowledge, correlation values between students' scores on *CSCU* and students' scores on *EDEP* for each group are obtained. With all the factors isolated as described above, we may assume causality; i.e. the proficiency in English is the causal factor for understanding the terms in the computing context. Hence, positive correlation result indicates that the students score higher in CS when they are more proficient in English. Pearson correlation factor is calculated for each group. The strength of the correlation, hence, the L-CS transfer level, is assessed at 5% significance level. Transfer occurs when the correlation is significant. The square of the correlation values indicates weaker relationships as the correlation values approach zero.

A null hypothesis is made that *CSCU* scores are not related to their *EDEP* scores for each and every one of the three groups.

Group	Group Label	Description	Number of Students
Group 1 (ARA 4)	HL	High maturity/ Low English (Arabic Literature Students - Y4)	32
Group 2 (BUS 4+ENG 4)	HH	High maturity/ High English Y4(*)	41
Group 3 (PREP)	LL	Low maturity/ Low English Y1 Preparatory (Y1) Students	23
(*) Group 2 is formed from 23 English Students and 18 Business Students Y4			

Table.4: Details of student groups.

Group	Correlation $R$	$R^2$	Significance $P$
Group 1 (ARA4)	0.2166	0.0469	0.320857
Group 2 (BUS4+ENG4)	0.4809	0.2313	0.007142
Group 3 (PREP)	0.2233	0.0499	0.283289

Table.5: A summary of the correlation results.

## 5. Results and Discussion

Table 4 shows the students' groups tested and the number of students in each group. Table 5 shows the correlation measure results  $R$ , the square of correlation,  $R^2$ , and the significance of the correlation results  $P$ . From this table we find that  $R^2$  values are close to zero for groups 1 and 3, which indicates a weak relationship between *CSCU* and *EDEP*. Group 2 correlation result, as the significance level assures, is the only result of significance at  $P < 5\%$ .

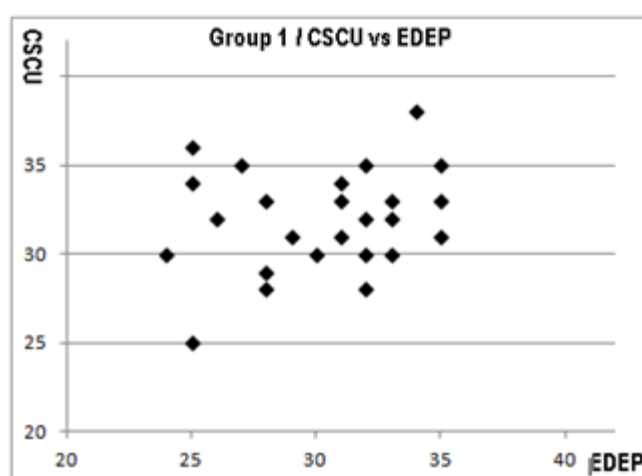


Fig. 1: *CSCU* versus *EDEP* for Group 1, ARA 4 (HL).

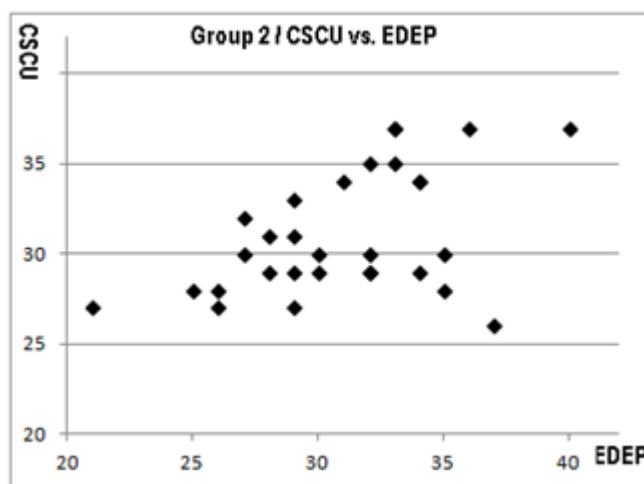


Fig. 2: *CSCU* versus *EDEP* for Group 2, Bus.4+Eng.4 (HH).

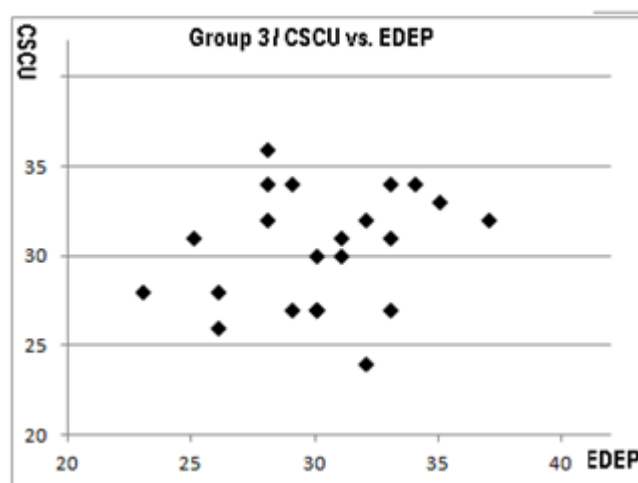


Fig. 3: *CSCU* versus *EDEP* for Group 3, Prep. Y1 (LL).

Figure 1, Figure 2 and Figure 3 show scattered plots of *CSCU* versus *EDEP* for groups 1, 2 and 3 respectively from which we see that a clear correlation pattern exists only for group 2.

The average transfer *TR* per student per term for group 2, the group with successful result, is calculated from the raw data and is found to be 0.38.

Hence, Group 2 students, the high English level students, are significantly more successful in inferring the meanings than the other two groups. That is, being knowledgeable in English makes acquiring computer science concepts easier. For both final year students studying mainly in Arabic (Group 1) and first year students (Group 3) the correlation results were insignificant with small  $R^2$  values (weak relationship). Hence, we conclude that maturity has no impact on L-CS transfer and the results for Group 2 can be only attributed to English.

However, one might inquire whether this necessarily imply that this group (if were to study CS) would be more successful in the final learning of CS; i.e. the learning assessed by performance on a programming project, a term/end of term test, or the overall GPA.

Moreover, this study did not object to tell about the amount of direct correlation between proficiency in English and the final performance on CS as many other factors can take place.



Nevertheless, it is legitimate to extrapolate the above result of positive impact on the initial acquiring of CS and to expect positive impact on the final CS learning. However, no or little impact is expected when extra pedagogy or other measures stand for the weakness in English.

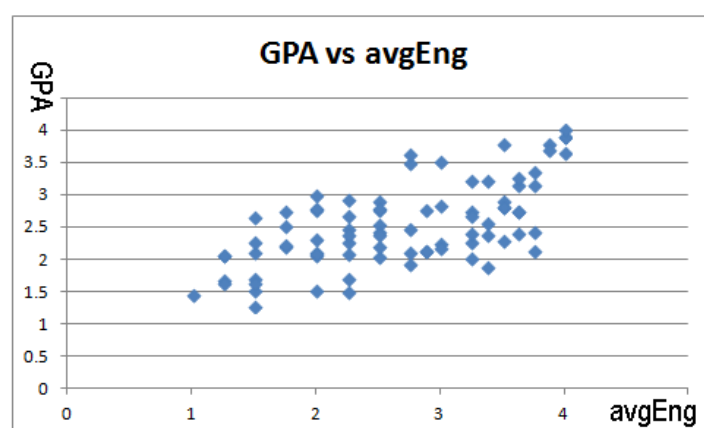


Fig. 4: *GPA* vs. *avgEng* (Average English Score).

Regardless of above argument, a statistical analysis using the records of third and fourth year CS students was done to find the correlation between CS students' proficiency in English (English 1 and English 2 grades average called *avgEng*) and their overall performance (*GPA*). This kind of analysis is an ex-post facto, non-experimental approach followed in many research works, e.g. (Martirosyan, Hwang, & Wanjohi, 2015). Figure 4 depicts the results obtained on a scattered plot of *GPA* versus *avgEng* scores of 82 CS students. A correlation value of 0.645 is calculated. This is a moderate positive correlation, which means that there is a tendency that a student *GPA* score goes up whenever his *avgEng* score goes higher. Again, we cannot attribute this correlation totally to our suggested transfer mechanism of English to CS concepts.

## 6. Conclusions

The paper reports on a test of students' comprehension of terms in both an English-language context and a computing context. The results showed positive correlation between proficiency of English and intuitive understanding of CS concepts (limited by the terms used in the test). In other words; improved English enhances initial acquisition of CS concepts. No impact of maturity on this relationship was found. This enhanced acquisition of CS is attributed to transfer from language to CS (L-CS transfer) and is justified in a way similar to what occurs in second language acquisition (human language to another language transfer).

Finding about the relationship above doesn't lead immediately to the impact of language on learning CS in general. This has motivated this work and can motivate more future works as well. Nevertheless, a non-experimental ex-post facto statistical analysis of CS students' records revealed that overall CS learning is enhanced in students of high English level proficiency.

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***Introducing Virtual Writing Centers in Japanese High Schools to Support Teachers  
Implementing Changes to the English Curriculum***

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**Abstract**

The recent and coming changes to the Japanese Ministry of Education English Course of Study and English requirements of the Japanese University Entrance Exam system have shifted the focus of the teaching and learning of English in Japanese high schools away from reading and listening towards writing extended texts in English. These changes have increased the workload of busy Japanese high school English teachers who were already struggling to create the time to provide individual feedback to their students. This paper considers the feasibility of introducing virtual writing centers into Japanese high schools to provide a resource for Japanese students of English to receive feedback on their English writing and support for high school teachers tasked with teaching L2 writing. The impact of Japanese Ministry of Education policy documents regarding the teaching of writing in high schools is briefly explained. Then, the role virtual writing centers could play in Japanese high schools and the English curriculum is discussed. The analysis considers how a virtual writing center model could be implemented to support the teaching of English writing in Japanese high schools.

Keywords: Curriculum, Japan, High School, English Writing, Writing Center, Online, Virtual, Peer-Learning, MEXT, Language Policy, Zoom

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## Introduction

This paper focuses on the implications of policy changes introduced by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) on the teaching and learning of English writing in Japanese high schools. It posits that for MEXT's objective to improve Japanese high school students English writing to be realised, students will require writing support beyond the classroom. First, policy documents accessed through the MEXT website regarding the Course of Study (CoS) for high school education, curricula guidelines tertiary education, and the Japanese university entrance exam are analyzed. Second, links between the policy directives and their potential impact on English teaching and learning are considered. Third, background information about the development of writing centers in universities and high schools in the United States (U.S.) and Japan is outlined. The document analysis and background information contextualize data collected from a semi-structured interview with the founder of Japan's first high school writing center. The operation and running of which informs the rationale for a proposal to introduce virtual writing centers in Japanese high schools.

## English Writing Teaching and Learning in Japanese High Schools

English writing has never been the focal point of high school English language teaching in Japan. Indeed, Hirose and Harwood (2019) summarize the research on Japanese high school students' English writing and explain that it can be characterized as:

(a) translation from Japanese to English; (b) accuracy-focused writing to learn vocabulary and structures; and (c) limited opportunities for students to produce their own ideas and thoughts in English. When writing is used in English classrooms it is employed as a service activity, i.e., practice/reinforcement of structures and vocabulary learned. Translation from Japanese to English at the sentence level is still a familiar activity in Japanese high school classrooms (Hirose & Harwood, 2019, p.73).

These characteristics do not reflect the educational policy objectives for English writing in Japan. MEXT oversees the implementation educational policy in Japan, and approximately every 10 years it revises the CoS guidelines which are sent to all the schools. The CoS includes explanations of the overall objectives for English teaching and learning in secondary school education, and specific goals for English learning with an overview of the curriculum contents and how they should be treated. Below are the 2009 CoS guidelines (MEXT, 2009a) for English writing instruction and its contents for high school level writing:

- Reading and writing with due attention to phrases and sentences indicating the main points, connecting phrases, etc.
- Writing coherent and cohesive passages on information, ideas, etc., based on what one has heard, read, learned, and experienced.
- Reading and writing with due attention to passage structure, relation to charts and tables, etc., while clarifying the points of the argument, evidence, etc.
- Speaking and writing to effectively convey the meaning to the audience, using carefully thought-out explanations and descriptions.
- Writing brief passages in a style suitable for the audience and purpose.
- Writing with due attention to phrases and sentences indicating the main points, connecting phrases, etc., and reviewing one's own writing.

These guidelines for English writing in Japanese high school are accompanied by further pedagogical objectives. However, in 2017 MEXT released guidelines that advocate for the use of teaching English with an emphasis on active learning. MEXT defines active learning as proactive and cooperative learning and instruction methods focusing on the discovery and resolution of issues (MEXT, 2017). An example of active learning is a structured peer review activity whereby students provide constructive feedback to one another on their drafts of a writing task. Although teachers around the country await new guidelines, the COVID-19 pandemic has delayed the release of the proposed 2022 CoS guidelines for high schools.

### **The Japanese University Entrance Exam**

Under the purview of MEXT the Common Test for University Admissions is produced by the National Center for University Entrance Examinations. The Common Test is a high-stakes test as it is used by national, public, and private universities to vet university applicants for admissions. It is administered in over 700 university sites throughout Japan, and every year approximately half a million students take the Common Test, which includes English writing and listening components. The test is intended to assess the ability of students to express what they think, make judgements, and identify and solve problems for themselves.

Prior to 2020 MEXT had planned to outsource the English component of the Common Test to private test providers that assess English using integrated tasks. Integrated tasks require the test-taker to produce written or spoken language based on their listening or reading comprehension and are used by tests providers such as The International English Language Testing System (IELTS). For example, students might be required read a news story and compose a written response to it based on a writing prompt. The research shows integrated skills tasks enhance assessment authenticity and validity by providing background knowledge to examinees (Gebriel, 2018). However, due to regional disparities regarding access to test centers, and the high cost of external tests for students, in 2020 MEXT decided against the use of private English test providers.

MEXT is currently in the process of revising how English will be assessed in future iterations of the Common Test. However, it is understood that they intend to shift the focus of the English high school CoS towards productive language skills, particularly English writing. As part of this initiative MEXT aims to use the writing component of local university exams. The Common Test is usually used to filter applicants in conjunction with another university-based exam. Designed by the professors at the individual universities, the local university exams often include an English composition section that normally entails composing a short essay or summary writing task (Watanabe, 2016). According to Chiwaki et al., (2021) MEXT intends to encourage universities to design integrated skills English exams that assess English writing and to provide “preferential treatment” to those universities that do. It is hoped that this emphasis on written English in local university exams will filter down to the teaching and learning of English writing in high schools and address the lack of positive test washback (the effect of a test on teaching and learning) regarding writing composition in high school curricula (see Kowata, 2015).

### **The Challenges Faced by Japanese High School English Teachers**

The proposed shift in focus towards English writing composition in Japanese high schools poses several challenges to Japanese high school teachers of English. Japanese high school English classes are usually quite large with teachers often required to teach multiple classes

of up to 40 students (Nishino, 2008). From a pedagogical perspective, large classes can have a severe impact on a teacher's time because evaluating and providing feedback on student writing is very labor intensive. This is a key factor in the findings of writing instruction research from studies in different high school contexts in Asia, Europe, and the U.S. The research shows that, in general, students in high school classrooms write infrequently and typically spend much less than an hour each day on writing (Graham, 2019; Graham et al., 2016). This is problematic as writing is an iterative process that involves allocating time to planning, drafting, revising, and editing. An iterative process that is particularly important for students writing in a second language. As Harris and Silva (1993) point out, the variety of concerns and questions of students writing in their second language means that the English writing classroom, as a sole resource, is insufficient for students to become proficient in English writing.

Moreover, the impact of the proposed shift towards English writing on a teacher's time is compounded by the fact that Japanese high school teachers are extremely busy with additional duties. For example, managing school clubs, preparing for school events such as sports day or culture festivals as well as attending to their responsibilities as homeroom teachers (Hirose & Harwood, 2019). The demands and issues outlined above strongly suggest that English writing support is required beyond the classroom in Japanese high schools.

## **Writing Centers**

In the 1970s writing centers were introduced in universities in the U.S. to support student writers (Harris, 1992). Typically, a writing center offers one-to-one tutorials in which a writing tutor discusses a draft of writing assignment with a student. Writing center tutors are not proof-readers or editors of a student's work. They avoid offering suggestions or opinions on the content of student writing. Instead, they usually employ a non-directive approach and use Socratic questioning to prompt students to discuss how their writing could be improved. This focus on the writer is intended to facilitate student's attempts to revise their own work through dialogue and the discussion of the principles and processes of writing (Ianetta & Fitzgerald, 2016).

In general, writing centers are staffed by either trained student (peer) tutors or professional tutors, depending on the funding and educational philosophy of the institution the center serves. The student peer tutoring model is very common, and popular with students as they often view tutorials with professional tutors as "merely an extension of the work, the expectations, and above all the social structure of traditional classroom learning" (Bruffee, 2016, p.325).

Since the 1970s writing centers have grown in number and now universities and colleges around the world increasingly provide a writing center that offers one-to-one tutorials. Writing centers have also been successfully introduced into high schools in the U.S. to support younger student writers. U.S. high school writing centers predominantly use the peer tutoring model and have older more proficient students tutoring students that need support with their writing.

The research regarding the benefits of peer tutoring is well documented (Badger, 2009). The benefits include enhanced engagement, communication, and independence skills; the promotion of critical thinking as well as an increased precision in how students express their



thinking (Smith et al., 2005; Topping, 1996), and increased comprehension of course content, confidence, and learner autonomy (Topping, 2005).

## **Writing Centers in Japan**

In 2004, writing centers were introduced in four universities in Japan (University of Tokyo, Sophia University, Waseda University, and Osaka Jogakuin College). All four university writing centers adopted the U.S writing center model (Johnson et al, 2008). Since 2004 the number of writing centers at Japanese universities has grown steadily (Delgrego, 2016; Nakatake 2013). This is due, in part, to two large scale government funded projects, and the subsequent expansion of English medium of instruction (EMI) courses in Japanese universities. The Global 30 Project in 2009 was introduced to promote the internationalization of Japanese universities and to encourage high caliber international students to study in Japan (MEXT, 2009b). In the project, 13 leading Japanese universities were selected to develop EMI degree programs and enhance international student support. The Top Global University project introduced in 2014 added a further 24 high-ranking universities to “enhance the international compatibility and competitiveness of higher education in Japan” (MEXT, 2014). In response to these project directives Japanese universities began offering EMI programs to attract international students and foster globally minded Japanese students. There are now “87 degree programs fully taught in English” (Bradford et al., 2022, p.1) in Japan. The rapid introduction of EMI programs in Japanese higher education created a need for students to seek writing support outside of the classroom, which has led to university writing centers being established throughout tertiary education in Japan. Given the autonomous nature of seeking help from writing center tutorials noted above, university writing centers are often part of or housed within student self-access centers.

Although few in number, writing centers have also been established in Japanese high schools. The first high school writing center was opened at International Christian University High School (ICUHS) in Tokyo. As the names suggests, ICUHS is affiliated with the International Christian University (ICU). ICUHS is located on ICU’s Tokyo campus, and many ICUHS students graduate high school and continue their education at ICU. The next section provides an overview of the ICUHS writing center. The overview is intended to serve as an example of how a physical high school writing center operates and to facilitate understanding of how a virtual writing centers could operate in high schools throughout Japan.

## **The ICUHS Writing Center**

The ICUHS writing center opened in 2010. It was initially intended for high school students to receive support for their Japanese writing; however, after a few months, students started to arrive at the writing center requesting help with their English writing assignments. Since 2013 the writing center has provided approximately 150 tutorials each year to support their students with their English academic writing.

The ICUHS writing center uses a peer tutor model whereby undergraduate students that attended ICUHS are employed as writing center tutors. In the Japanese context there are several benefits to this model. As graduates of ICUHS the university students employed as tutors are a known quantity. In Japan relationships are paramount so first-hand knowledge of writing center tutor candidates provides the school with several assurances. Principally, it is enables ICUHS to select trustworthy, reliable, and academically capable former students with the appropriate social skills to provide writing support for their current high school students.

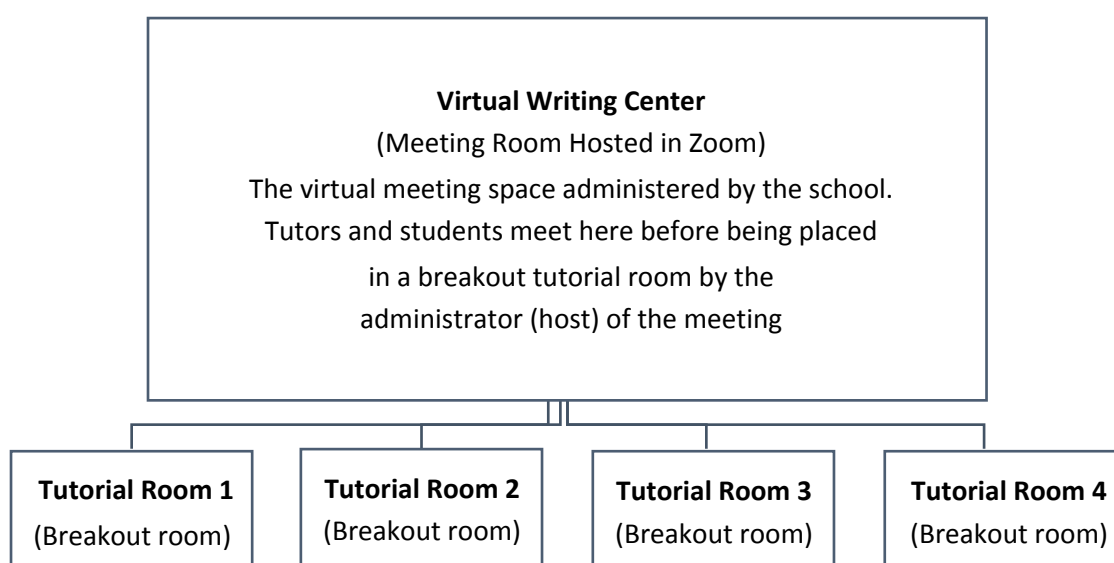
Furthermore, the fact that the ICUHS writing center tutors have attended and graduated ICUHS means that they have official *senpai* status within the school. When Japanese enter junior high school, they are initiated into *senpai* - *kohai* relationships. A *senpai* is a student who is older or superior in ability (a senior). A *kohai* (a junior) refers to someone who started at the school after their *senpai*. *Senpai* - *kohai* relationships are ubiquitous in Japanese society. *Senpai*'s have higher social status and are traditionally shown deference and respect by their *kohai*'s because they are thought to have more experience, wisdom, or knowledge. However, the relationship is interdependent as the *senpai* is expected to provide support, friendship, and advice to the *kohai* (Davies & Ikeno, 2002). This traditional Japanese relationship transfers well to the writing center peer tutor context where experience and knowledge of the tutor should be respected by the student, and knowledge and advice should be imparted in a friendly and supportive manner by the tutor.

### Online and Virtual Writing Centers

Since the advent of the internet, online services have been provided by university writing centers in the U.S. Indeed, Hughes (2015) documents the history of the University of Wisconsin-Madison online writing center and traces it back to 1995. Early online writing centers were restricted by the technology of the time and offered a miscellany of, largely asynchronous, services (Breuch, 2005). Tutor services were often provided via email with document exchanges between the tutor and student and typed feedback given by the tutor on those documents. The introduction of synchronous collaborative file editing applications such as *DocVerse* in 2010 and *Google Docs* in 2012 enabled similar text-based tutorials to be offered synchronously. Although Skype and videoconferencing applications were available at this time, they were unreliable due to issues related to internet connectivity and bandwidth (Raigh, 2013).

In the last decade bandwidth (the volume of information that can be sent over an internet connection in a measured amount of time) has greatly increased. Coupled with the rapid development of videoconferencing applications such as *Zoom* this has led to many university writing centers offering virtual tutorials with synchronous online video and document sharing functionality. Also, the closure of campuses and social distancing requirements brought about by the COVID-19 pandemic provided an impetus for writing centers to open virtually and offer writing support for students taking classes online.

An example of a virtual writing center (VWC) is provided by Harwood and Koyama (2021) who created a VWC using the Zoom videoconferencing application (see Figure 1). In short, the VWC was created each day in the form of opening a Zoom meeting and using breakout rooms as private tutorial spaces. Tutorials are scheduled with students using an online form created using *Wufoo* forms. The Zoom meeting hyperlinks and passwords are emailed to tutors and provided to students who book an appointment. When the tutors and students connect to the Zoom meeting, they are assigned a breakout room: a function that allows the meeting host to create and manage multiple separate private meeting spaces within the Zoom meeting.

**Figure 1.** A Visual Representation of a VWC Using the Zoom Video Conferencing Platform

Harwood and Koyama (2021) note that breakout rooms have several affordances for students and tutors. Students can discuss their writing in private with tutors and receive face-to-face verbal feedback in a one-to-one setting. They can also share their writing document using the screenshare function. The tutor can read the student writing in the breakout room and clarify their verbal feedback using the virtual whiteboard and chat functions.

### **Rationale for Introducing Virtual Writing Centers in Japanese High Schools**

As outlined earlier, MEXT's goals and policy guidelines regarding English writing in high school classrooms pose several challenges to Japanese high schools and their English teachers. VWCs have numerous affordances that could address some of these challenges. The high school VWC model proposed here is a virtual version of the physical ICUHS writing center discussed earlier. It would operate in the same way as the VWC shown in Figure 1. However, because high school students are minors and the responsibility of their high school, students would need to connect to the virtual tutorials at school using designated school spaces and computers.

On the one hand, the ICUHS writing center model is possible because the high school and university share the same physical campus. On the other hand, VWCs would enable all high schools to implement a ICUHS writing center model because prospective tutors would not need to be physically present in the school. Therefore, the high schools' former students could be employed as virtual tutors and conduct tutorials from all over Japan, irrespective of their physical location or the location of their university.

As with the ICUHS writing center, former high school students that have the academic and social skills to provide writing support for current high school students could be selected as virtual writing tutors by the English teachers at high schools that open virtual writing centers. The value of employing students that have graduated from the high school they would be tutoring at is significant. As with the ICUHS writing center, the fact that the tutors would have been taught by the teachers that would be teaching the students that attend the VWC would give the tutors official senpai status within the school. This is important because the

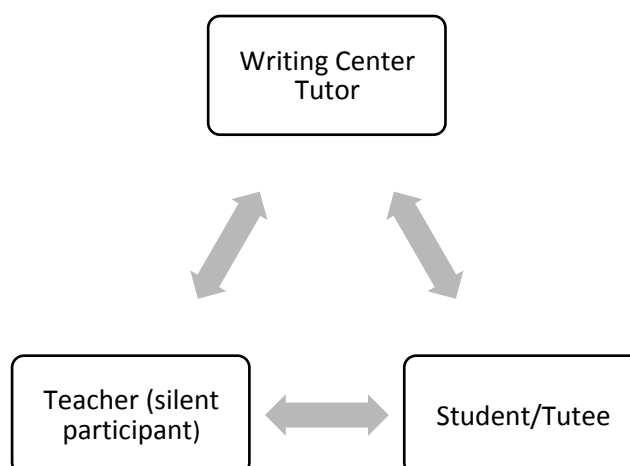
students seeking writing support at the VWC will know that their teachers have approved their former students as suitable tutors and assume the kohai role in the tutorial. Another upshot of such tutors is they may also have relevant experiences with the writing assignments, which can facilitate them to provide more useful feedback to their kohais. Moreover, teachers at the school will also be able draw upon their previous teacher/student relationship when selecting prospective tutors and training them as virtual tutors.

VWCs provide other advantages as the technology can be exploited for training tutors (Rosalia, 2013). Virtual tutorials in breakout rooms can be recorded and utilized as learning objects by teachers that oversee the VWC. For example, recordings can be used for the training of appropriate strategies and techniques for giving feedback. Tutors can view recordings with teachers and reflect on what techniques they employed and how they could improve their tutoring in similar interactions in future tutorials. Furthermore, if a tutor wants to observe another tutor or a teacher wants to show a new teacher a model of an experienced tutor, they do not need to schedule an observation. They can simply view example tutorials selected by the teacher for training purposes. The ability to record tutorials also offers schools an extra layer of surveillance and security when dealing with accusations made by tutors or students about inappropriate conduct or behavior in the virtual tutorials.

### **Factors to Consider when Introducing VWCs in a Japanese High Schools**

*Teacher buy-in:* Often when a new initiative is introduced in a school, concerns surrounding teacher buy-in, and implementation emerge. Teachers need to believe in the value of the initiative or reform for it to succeed. Turnbull (2002) identifies six predictors of teacher buy-in to new initiatives, “adequate training, adequate resources, helpful support from the model developers, school-level support, administrator buy-in, and control over the reform implementation in their classrooms” (p.248). Teachers, then, will require training and support for the implementation and running of VWCs. Resources and equipment such as laptops and secure videoconferencing applications should be budgeted for and allocated. Opportunities to meet and visit existing (model) VWCs and their creators should be organized and facilitated by school principals and administrators. Most importantly, teachers should oversee how the VWCs support the teaching and learning in their classrooms.

*Tutorial issues:* A common tutorial issue concerns the role of the writing center tutor because tutors are in a tutorial triangle with the student and the student’s teacher. Although, tutors provide one-to-one support to students, the student’s teacher is a silent participant in the tutorial (see Figure 2). This is because the teacher specifies the requirements of a writing assignment, and the requirements shape what is focussed on in tutorial sessions, even though the teacher is not present.

**Figure 2 . The Tutorial Triangle**

The tutorial triangle can lead to issues related to how the tutor conducts the tutorial. Tutors will, at times, perceive themselves as teachers and become more “teacherly” in tutorials. This inevitably leads to issues such as tutors evaluating student writing, providing suggestions and opinions on content instead of asking Socratic questions, and even questioning the pedagogy of the instructor (Thonus, 2001). These are perennial writing center issues, but they can be mitigated, to a large extent, through regular training sessions.

Therefore, schools must decide upon and clearly define their expectations of the tutor's role in virtual writing centers. High school English teachers should provide detailed descriptions of the tutor's role and ongoing training for their VWC tutors. The descriptions of the tutor's role should acknowledge how tutors are frequently caught between the expectations of the teacher regarding their students writing and the expectations the student has about the role of the tutor. Including high school English teachers in the decision-making of the implementation VWCs is important. Listening to teachers concerns and advice regarding operational decisions such as tutor recruitment, training, and tutorial scheduling will also boost their buy-in of VWCs.

## Conclusion

This paper has provided an overview and analysis of MEXT curricula directives, and the challenges faced by Japanese high schools implementing them. It has argued that for the objective to improve students written English to be met that Japanese high schools will need to provide support and resources to Japanese teachers of English and their students. Writing centers as a student resource and their growth over the last 18 years in Japanese universities has been discussed. The operation and affordances of the first Japanese high school writing center has also been discussed and used to illustrate how virtual writing centers could provide writing support to high school students beyond the classroom. In addition, suggestions regarding how to mitigate pedagogical issues within tutorials have been outlined. The introduction of VWCs into Japanese high schools is an ambitious proposal, but one that provides a practical and workable solution to a pedagogical issue. However, their implementation requires the buy-in of school administrations and teachers in order for the initiative to succeed.

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***A Critical Evaluation of the National Programme on Technology Enhanced Learning (NPTEL): The Flagship Indian Massive Open Online Courses (MOOCs) Programme***

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**Abstract**

NPTEL is a prominent Indian example of an online learning system backed by the Indian State. Driven by the government regulatory policy and learners' needs, NPTEL has become popular with students enrolled in the Indian higher education sector, especially in engineering and science disciplines. This paper critically evaluates NPTEL among Indian learners using NPTEL and field survey data. The data analysis for various engineering and science MOOCs is based on parameters such as registration rate, completion rate, type of users, and the reasons for using NPTEL. Firstly, the study shows a high completion rate for Computer Science and Engineering (CSE) and Professional Communication courses, but low completion rate for Physics and Electrical and Electronics Engineering courses. Secondly, most students have pursued programming courses of CSE in NPTEL. The field survey revealed positive student feedback on their institute's effort and help to pursue and complete NPTEL courses. However, it also highlights the disparity between students of public and private colleges in receiving monetary aid for pursuing NPTEL courses. Finally, the last section discusses the implications and observations of NPTEL based on our findings and the future scope of work on MOOCs policy.

Keywords: MOOCs, India, NPTEL, Policy, Engineering and Science

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## 1. Introduction

MOOCs emerged in 2008 when George Siemens and Stephen Downes launched an online course on 'Connectivism and Connective Knowledge'. Stephen Downes referred to it as 'cMOOCs' or 'connectivist MOOCs' (Downes, 2012). The focus was on creating and sharing knowledge among learners. Later in 2011, two professors, Sebastian Thrun and Peter Norvig, from the Computer Science Department of Stanford University, launched an online course titled 'The Introduction to AI (Artificial Intelligence)'. Downes termed this kind of MOOC xMOOC (Downes, 2012). The following year, 2012, saw the launch of two private MOOC platforms, which led to the year being called the 'Year of MOOCs' (Pappano, 2012).

The Indian government, too, got influenced by the idea of MOOCs (Pandey, 2014). The National Programme on Technology Enhanced Learning (NPTEL), started by the Government of India, is an Indian xMOOC platform that has become synonymous with online learning in India, along with Coursera, edX and Udemy (Sharangpani, 2017). The platform got a boost when the Government of India introduced the SWAYAM Regulation Act 2016, allowing the use of NPTEL courses for credit transfer (AICTE (Credit Framework for Online Learning Course through SWAYAM) Regulations 2016, 2016).

All the hype around NPTEL has revolved around the rhetoric of high enrolments for NPTEL MOOCs (Choudhury, 2019; Nanda, 2019). However, like other MOOC platforms, it is also plagued with high dropout rates. There is a substantial gap between the enrolments and completion numbers that vary with disciplines and their courses. As of December 2020, NPTEL enrolments stood at 12.4 million, while only approximately 0.64 million (~5%) users completed the courses (NPTEL, 2021). The overall data does not present the break-up of the disciplines/subjects contributing to high enrolment numbers or varying completion numbers. This study focuses on analysing NPTEL MOOCs by addressing the following questions:

- What are the disciplines and courses of NPTEL for which students enrol and register?
- Who are the dominant users of NPTEL MOOCs in various disciplines?
- Which disciplines/courses are suitable for the MOOCs mode in engineering and sciences?
- How is NPTEL (SWAYAM) policy being implemented in universities in India?

## 2. Literature Review

### 2.1 Issues associated with MOOCs completion

The emergence of MOOCs created enthusiasm among learners, which was reflected in the large enrolment numbers in different MOOCs (Pappano, 2012). However, despite the rise in their popularity, it has not been a smooth ride for MOOCs (Ahmad, 2018). One of the main criticisms of MOOCs has been the low completion rates (or high dropout rates) in contrast to the high enrolment numbers (Koller et al., 2013; Liyanagunawardena et al., 2014). Clow termed this phenomenon a 'funnel of participation' and argued that MOOC users have little commitment during the MOOCs' initial period.' Therefore, the filtering of learners happens at later stages of MOOCs (Clow, 2013).

Most MOOCs have completion rates of 6-10% (Franceschin, 2016; Jordan, 2014; Murray, 2019). There are several reasons which can lead to high dropout rates, such as lack of time, course difficulty, lack of digital skills, differing expectations, bad peer reviews (Onah et al.,

2014), learner's attitude toward learning: motivation, goal-setting, self-regulation, self-satisfaction (Littlejohn et al., 2016). Watted and Barak have argued that career and educational benefits affect the completion of MOOCs (Watted & Barak, 2018). However, Watted and Barak's analysis is based on the MOOC course 'Nanotechnology and Nanosensors'. Our study examines the hypothesis across several engineering and science courses of NPTEL.

Some argue the completion rate (conversely, the dropout rate) also depends on the duration of a given MOOC course. Jordan (2015) observed that the shorter the MOOC period, the higher the completion rate. The duration of MOOCs can vary from weeks to months. NPTEL courses have fixed durations: four weeks, eight weeks, or twelve weeks (NPTEL, 2019a).

## **2.2 The Evolution of NPTEL**

The NPTEL program was envisaged in the year 1999 with the collaboration between seven IITs (Indian Institute of Technology) and IISc (Indian Institute of Science) Bangalore, and funded by the Ministry of Human Resource Development (India, 2007).

Phase 1: The first phase of NPTEL was from 2003 to 2007. According to the official NPTEL document (India, 2007), the aim was to develop high-quality learning material and make it accessible to engineering students and teachers across the country. The focus was on creating e-learning content on videos and web content for various engineering disciplines. The learning materials were also available on CDs and DVDs (NPTEL, 2020b).

Phase 2 and 3: Phase 2 (2009-2014) and Phase 3 (2015 onwards) introduced more online content besides Phase 1 courses (NPTEL, 2020a). In Phase 3, NPTEL also opened its online courses for certification. The NPTEL Online Certificate (NOC) program was started to enhance the reach of NPTEL content by making it more attractive to potential students. The inception of NOC proved to be a significant step toward laying the foundation for the SWAYAM Regulation Act 2016. After the enactment of the Act, SWAYAM then subsumed NOC under its regulation. After successfully completing a course under SWAYAM, the certificate earned is eligible for credit transfer in any college/institute (State or Private) in India (AICTE (Credit Framework for Online Learning Course through SWAYAM) Regulations 2016, 2016).

## **2.3 What makes NPTEL Online Certificate (NOC) Program Different from Other MOOC providers?**

There are significant differences between NPTEL and other MOOC providers, such as Coursera, edX, Udemy, etc. NPTEL is a public MOOC platform, while these popular MOOC platforms are more or less private.

NPTEL has set a standard criterion for assessing NOC courses: weekly assignment submissions and a final examination. The assignment submission carried a 25% weightage, while the end-of-course examination had a 75% weightage. However, from July 2019, the new criterion requires learners to have an average assignment score  $\geq 40$  and a final exam score  $\geq 40$  (NPTEL, 2020a).

The NOC learners must complete the in-person proctored, online end-of-course examination to get the course certificate. The examinations are held in over 130 cities across India. The

learner's ID (any government-issued or student ID), submitted during the enrolment of the course, is cross-verified at the examination centre to avoid the use of fraudulent means (NPTEL, 2020a). In contrast, other MOOC providers do not have any common assessment criteria. They are just content/course aggregators which run on different monetary business models for sustenance (Pani, 2019).

The certification exam fee is around INR 1100 (approximately \$15), which is nominal (NPTEL, 2020a). The certificate cost of other MOOC providers, such as Coursera, edX, etc., is high compared to NPTEL certification. Coursera charges \$39-\$79 based on subscription or individual pricing models (Shah & Pickard, 2021), while edX prices its certification between \$50-\$300 (edX, 2019).

### **3. Method**

The data source used for our study is available on the official NPTEL Online Certification (NOC) web portal (NPTEL, 2020c). The portal contains data for various engineering, science and humanities discipline MOOCs. However, we restricted this study's scope to engineering and science disciplines.

#### **3.1 NPTEL MOOCs Research Data Set and Caveats**

The enrolment number in NPTEL MOOC courses varies across disciplines and within disciplines. We have considered courses with at least a thousand enrolments for this study. The courses having 5% lesser enrolments of a thousand, i.e., courses with enrolment numbers above 950, have also been considered. We examined the data published by NPTEL for four semesters (Jul-Dec 2017, Jan-June 2018, Jul-Dec 2018, Jan-June 2019 and July-Dec 2019) though the data is available till the 2020-21 semester. However, the NPTEL data for 2020 is still getting updated. We have classified the courses into five different groups of disciplines for this study:

- Computer Sciences and Engineering (CSE),
- Electrical and Electronics Engineering (EEE),
- (Core) Engineering disciplines (Mechanical Engineering, Civil Engineering, Chemical Engineering),
- Professional Communication, and
- Sciences (Mathematics, Physics and Chemistry/Biochemistry).

CSE and EEE courses are further divided into sub-disciplines based on specialised subjects. The reason for separating CSE and EEE courses from Core Engineering courses is the magnitude of enrolments and the distinct patterns observed in the CSE and EEE. It also prevents Simpson's paradox (Agresti, 2007) which is observed if the sub-disciplines are combined with (Core) Engineering for the analysis. Simpson's paradox occurs when the trend is observed when data is grouped but reverses or vanishes when data is combined (Agresti, 2007).

#### **3.2 Survey Data Set**

Based on SWAYAM(NPTEL) regulation on the use of NPTEL in higher education, we conducted an in-person survey with the students of engineering and science colleges. We selected state and city of colleges based on the number of colleges located in the region using

stratified random sampling. We surveyed the following Indian states: Uttar Pradesh, West Bengal and Maharashtra.

We requested students to participate and fill in the NPTEL survey questionnaire. The questions focused on eliciting students' perceptions about the support provided by their college to implement the NPTEL policies. The response to the questions was measured using a 5-point Likert scale. The responses were also subjected to a statistical test using Kendall Tau-B ordinal (we considered the Likert response as an ordinal variable). Kendall Tau-b is a non-parametric test to measure the goodness of association between variables when one variable is ordinal (SPSS,2022).

### 3.3 Terminology

Before analysing the NPTEL MOOCs, it is important to define enrolment, registration and completion rates for NPTEL data (NPTEL, 2020d). Enrolment is the number of users interested in pursuing a particular NPTEL course by enrolling before it begins.

Registration is the number of enrolled learners who have registered for certification in a course. Registration rate is the percentage of enrolled learners registered for the certification. Completion rate is the percentage of the registered number of learners who have completed the course by appearing for the final course examination. It includes people who have completed the course 'successfully' and those who did not pass the course (which NPTEL refers to as 'participation'). The completion (retention) rate, therefore, is:

$$\text{Completion Rate (Retention)} = \frac{\text{No.of Users taking the course end exam}}{\text{Registered Users}} * 100 \quad (1)$$

## 4. Findings and Analysis

### 4.1 Enrolment and Registration

The data, shown in Figure 1, indicates that Computer Science and Engineering (CSE) courses capture the bulk of enrolment numbers among all subjects. Chemical Engineering and Chemistry have the lowest enrolment numbers among all the disciplines. However, the registration numbers of all disciplines are meagre compared to their enrolment numbers (From Figure 1). CSE courses have the bulk of registration numbers though the registration rate is lesser than the rate of Professional Communication courses.

Computer Science and Engineering (CSE): Table 1 shows that a substantial portion of CSE enrolments are from Programming courses (Python, C and C++). The other popular courses with higher registration rates are Database Management Systems (DBMS) and the Internet of Things (IoT). It is also interesting to note that Artificial Intelligence, which has high enrolment, has an abysmal registration rate. The data also shows that traditional programming courses overwhelmingly attract more students than contemporary CSE courses. This includes the newer specialisations like Artificial Intelligence and Human-Computer Interface. It is also important to note that the data on *Blockchain* is an outlier as it makes up only one course conducted in July-Dec 2019, unlike other CSE courses conducted multiple times on NPTEL.

Electrical and Electronics Engineering(EEE): In EEE, we found Electronics Engineering and Electrical Engineering courses have higher enrolment numbers than other EEE sub-

disciplines. However, Miscellaneous (EEE) and Signal Processing courses have the highest registration rates at 11.5% and 10.4%, respectively.

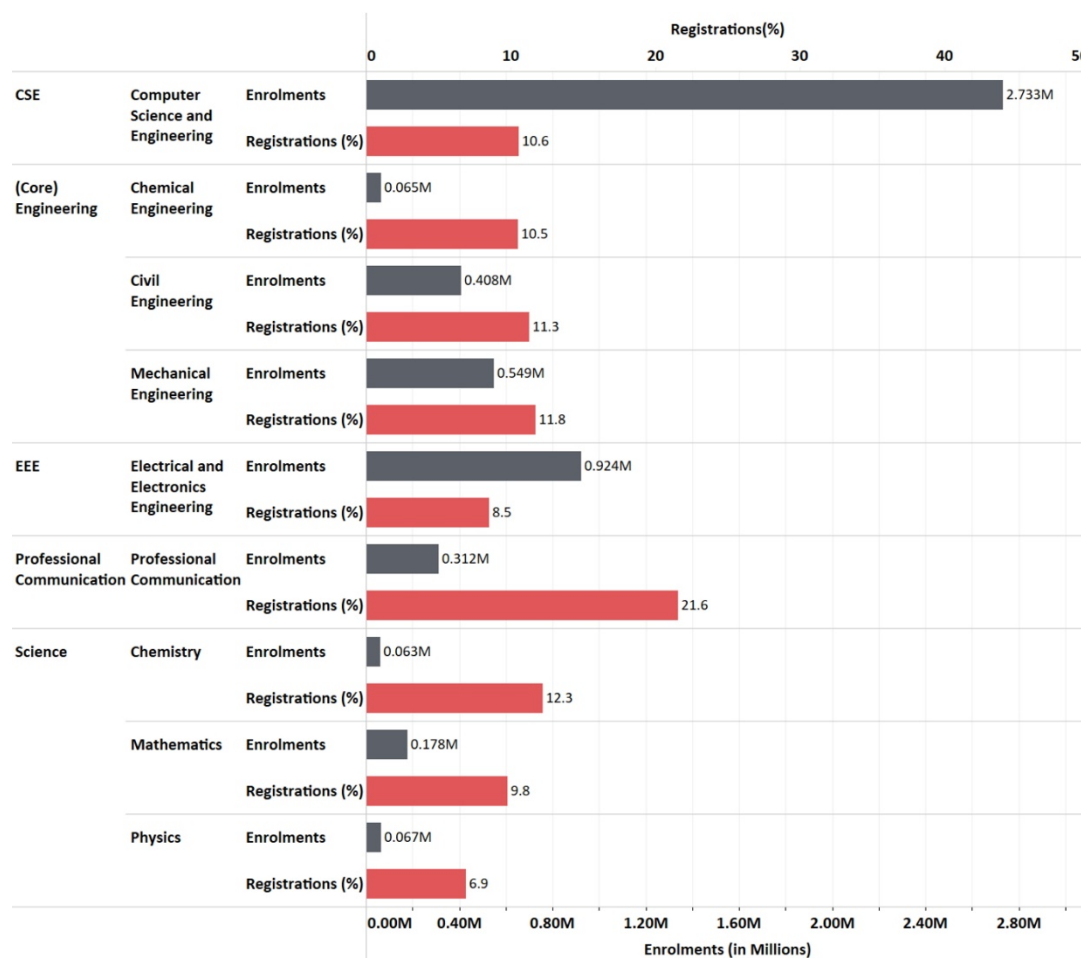


Figure 1: Enrolment and Registration (%) for the disciplines.

The analysis showed specific courses with high registration rates compared to other courses within (Core) Engineering disciplines of NPTEL. Re-run of the Mechanical Engineering course, 'Laws of Thermodynamics' in 2018, saw a mammoth 65% registration. The same course in 2017 had only a 13.6% registration rate. The course 'Integrated Waste Management For A Smart City' in Civil Engineering courses had a 29% registration rate. The course 'Electronic Waste Management-Issues and Challenges' had a 30% registration rate in 2019, while the same course in 2018 had a 13% registration rate. In Chemical Engineering, 'Technologies For Clean And Renewable Energy Production' and 'Chemical Process Safety' had a 24% and 21% registration rate, respectively.

Examining courses in Professional Communication revealed that the 'Enhancing Soft Skills and Personality' course had the maximum enrolment numbers, while 'Soft Skills' had the highest registration rate.



Stream	Subject/Sub-Disciplines	Enrolments	Registration Rates(%)
Computer Science and Engineering	Algorithm	1,43,371	7.2
	Artificial Intelligence	3,23,862	6.8
	Blockchain	1,801	90.9
	Cloud Computing	1,68,104	7.7
	Computation	1,05,000	8.1
	Computer Architecture	50,041	7.5
	Computer Design	42,563	10.4
	Computer Security	59,900	8.1
	Data Science	1,16,081	9.7
	Database Management System (DBMS)	1,62,498	12.9
	Embedded	20,927	9.0
	Human-Computer Interface (HCI)	12,623	5.3
	Inter-disciplinary	1,204	5.6
	Internet of Things (IoT)	1,66,564	16.0
	Networks	1,03,676	10.0
	Operating System (OS)	41,558	9.0
	Programming	11,74,367	12.0
	Software Development	38,736	10.1
Electrical and Electronics Engineering	Communication Engineering	1,65,615	6.6
	Control Engineering	72,285	9.2
	Electrical Engineering	2,56,264	8.2
	Electronics Engineering	2,90,051	8.9
	Miscellaneous	52,740	11.5
	Signal Processing	87,065	9.4
Professional Communication	Better Spoken English	32936	9.7
	Business English Communication	12135	11.5
	Developing Soft Skills and Personality	67879	29.9
	Development Research Methods	1621	10.4
	Employment Communication (A Lab based course)	4682	15.2
	English Language for Competitive Exams	25874	9.8
	Enhancing Soft Skills and Personality	55084	25.7
	Intellectual Property	2167	17.3
	Interpersonal Skills	6567	23.7
	Soft Skills	39767	30.9
	Speaking Effectively	25350	12.6
	Technical English for Engineers	37656	19.6

Table 1: Enrolment and Registration Rate (%) of Sub-Discipline and Courses of CSE, EEE, and Professional Communication

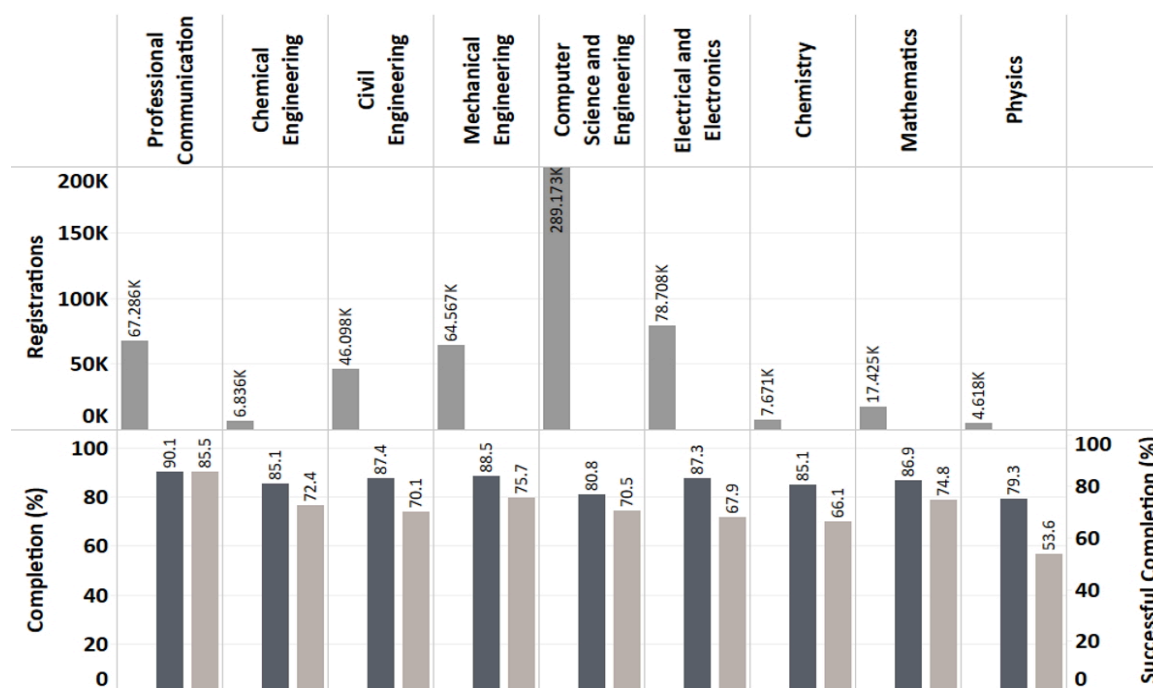


Figure 2: Registration, Completion rate, and Successful Completion Rate of the disciplines

## 4.2 Completion Rate

Figure 2 shows the registration numbers and corresponding completion rates for various disciplines. The figure shows that major 'funneling' (Clow, 2013) of learners' participation occurs between the time of enrolment and registration of the course. Evidently, all disciplines except Physics have similar completion rates post NPTEL registration.

However, a different picture emerges if we examine the fraction of learners among the registered users who completed the course and did so successfully. Figure 2 shows that Professional Communication courses have the highest successful completion rates among all the disciplines. On the other hand, Physics, Chemistry and EEE courses have the lowest successful completion rate.

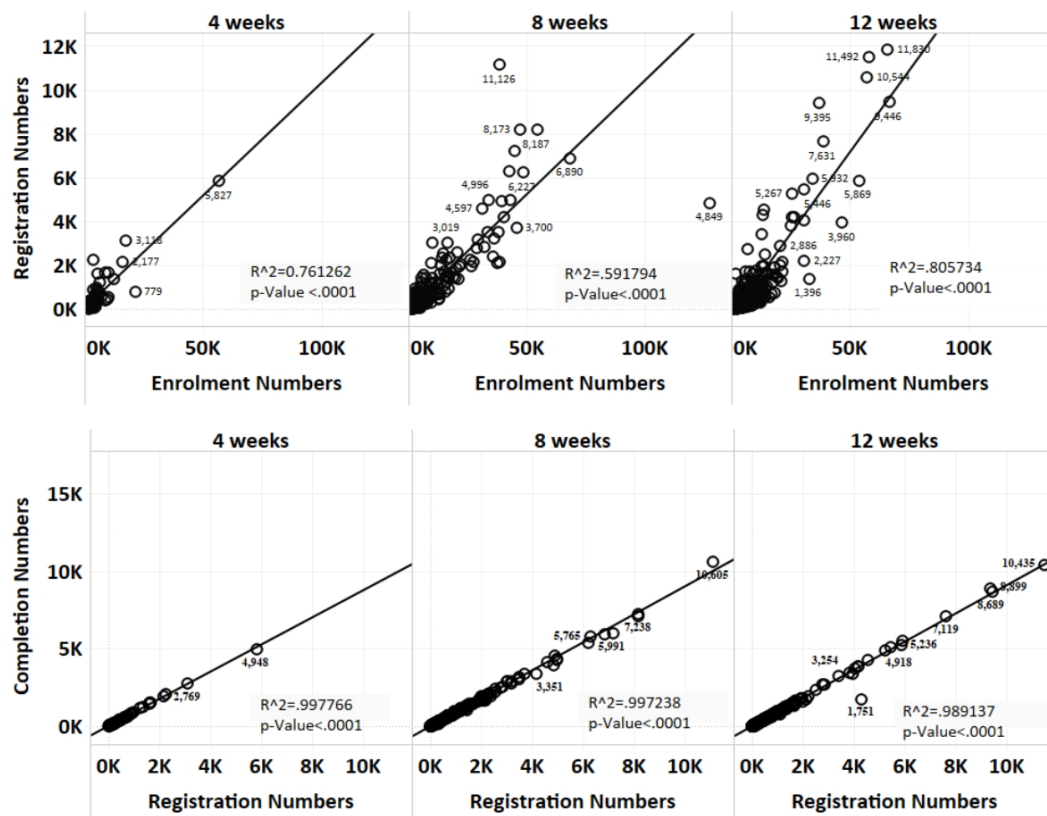


Figure 3: Relation Between Enrolment and Registration (top) and Registration and Users who Completed MOOCs (bottom), for the Three Durations.

### 4.3 Impact of Course duration on Registration and Completion Numbers

Figure 3 shows the correlation between enrolment numbers and registration numbers (top) and the correlation between registration numbers and completion numbers course (bottom) for the three different durations. The correlation between enrolment numbers and registration numbers is strongest and positive for 12-weeks, and moderately strong and positive for 8-weeks and 4-weeks NPTEL courses. The correlation between registration numbers and completion numbers is also strong and positive for all three durations. Therefore, the analysis shows that registration rates and users completing the NPTEL MOOCs are not inversely related to its duration. This finding is contrary to Jordan's observation (Jordan, 2015).

### 4.4 Types of Users

The NPTEL categorises its registered users into 'Students', 'Faculty', and 'Others'. The cumulative user data indicates that most users are students, though it cannot be generalised for all the courses. Some courses have higher faculty participation than students.

#### 4.4.1 Faculty as Users

Figure 4 exhibits student and faculty users as a percentage of each discipline. Science courses have more faculty as users, followed by EEE courses, while Professional Communication and CSE courses have higher student participation.

The high faculty participation motivated us to examine the number of courses in each discipline contributing to this high level of participation. Figure 5 shows the faculty users fragmented into three percentage distribution bands based on the number of courses in each discipline: '>40%' of courses, '>20% and <=40%' of courses and '<=20%' courses. Most of the Chemistry and Mathematics courses have almost 50% of faculty users than student users of NPTEL. For example, Mathematics courses such as 'Integral Equations, Calculus of Variations and its Applications', ' Ordinary and Partial Differential Equations and Applications ' had over 60% of the faculty. 'Semi-conductors Optoelectronics,' 'Fibre Optics,' and 'Solid State Physics' of Physics had over 50% of faculty users.

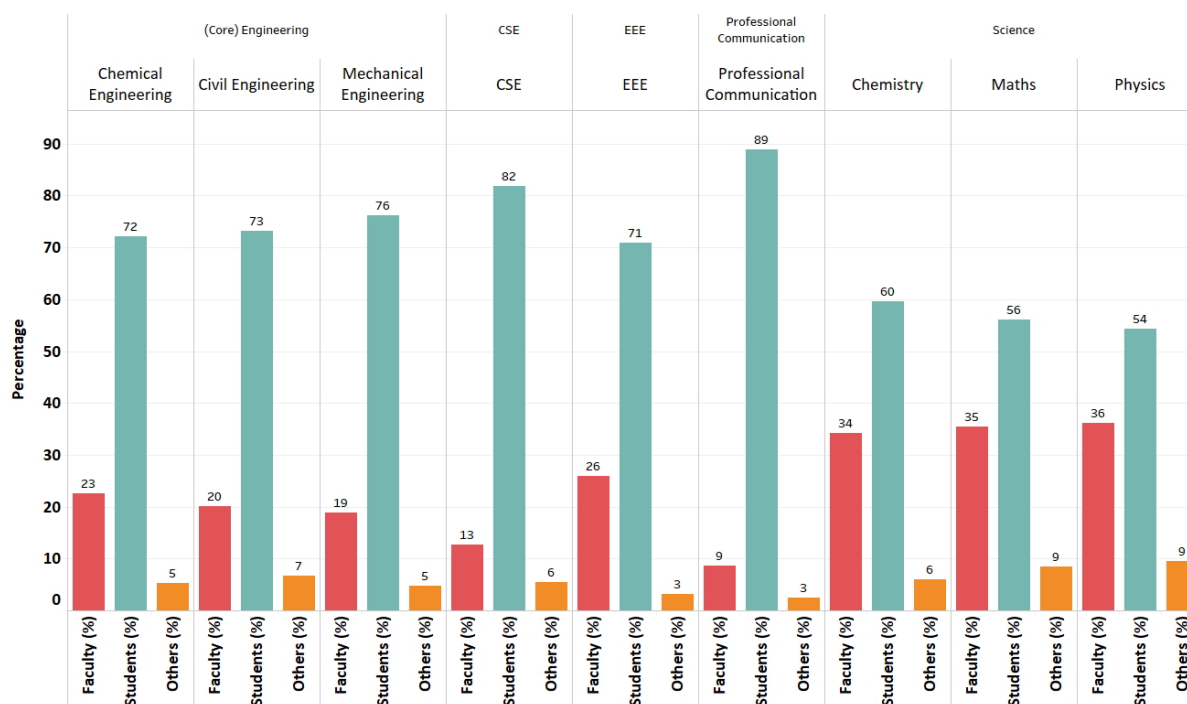


Figure 4: User Distribution, Category-wise, as Percentage, for Various Disciplines

In EEE, Communication Engineering and Electrical Engineering (from Figure 5) contribute or have higher faculty participation (From Figure 4). Though faculty participation is considerably lesser than in Science, it is still higher than CSE and Professional Communication courses. Albeit the percentage of faculty users in (Core) Engineering is lower than that of Sciences and EEE, a few courses had high faculty participation, such as, 'Geosynthetics Testing Laboratory' (68%) from Civil Engineering and 'Heat Exchangers: Fundamentals and Design Analysis' (43%) from Mechanical Engineering had a significant percentage of faculty users.

#### 4.4.2 Students as Users

Students make up a high percentage of users of CSE courses, as depicted in Figure 4. The Programming courses have 90.3% of students, followed by Database Management Systems (DBMS) and Operating System courses, respectively, at 87.2% and 83%. Courses on Human-Computer Interface (HCI), Computer Design and Data Science have a lower percentage of student users than other CSE courses. The conventional CSE courses (such as Programming and DBMS) have a higher registration rate than the newer CSE courses (such as Artificial Intelligence and Data Science). This may be because of the lack of quality faculty for

conventional CSE courses in engineering, IT companies seeking more programmers for jobs, lack of sufficient learning among students, or the students of other disciplines are also pursuing these courses to make themselves employable.

Professional Communication courses have the highest student participation among all disciplines, as shown in Figure 4. Courses such as 'Soft Skills', 'English Language for Competitive Exams' and 'Speaking Effectively' have over 90% of students, which points to the possibility of colleges running these courses as compulsory courses in their curriculum as a reflection of embracing SWAYAM policy.

In EEE, almost all the courses of its sub-disciplines have a similar percentage of student users. The percentage of students in the sub-discipline of EEE lies between 68% -74%, showing that over two-thirds of the users are students. It possibly shows that students are facing difficulty in classroom learning. Or, faculty is unavailable in the institutes for EEE subjects; therefore, courses are being offered via NPTEL with credit transfer provisions.

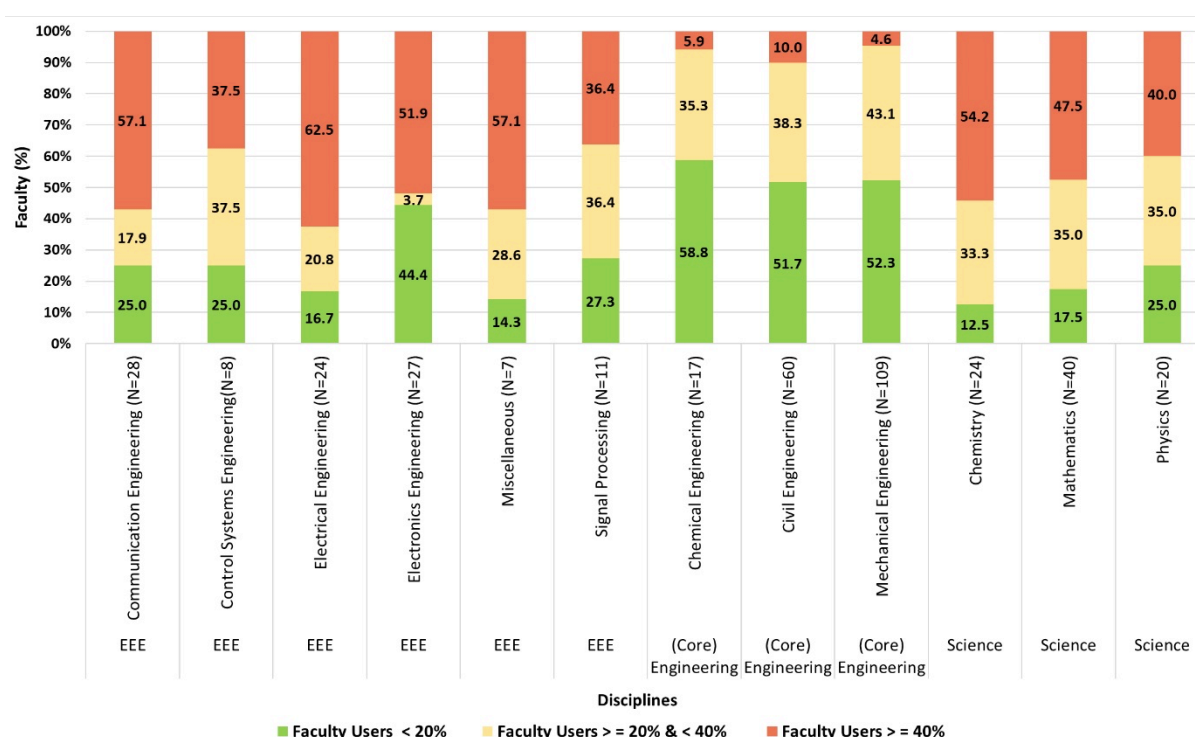


Figure 5: Distribution of Faculty Users for EEE, (Core) Engineering and Science Disciplines (N=No. of Courses)

#### 4.5 Reasons for using NPTEL MOOCs

As SWAYAM/NPTEL platform is a large-scale MOOCs-based learning platform with a valid certification process, used pan India, several factors influence its use among learners. NPTEL data captures the reason users pursued an NPTEL course. The data on the 'Reasons for using NPTEL' is exclusive, i.e., the user was allowed to select only one reason from the given set of reasons. However, this is not always the case, as users may have more than one reason for using NPTEL or any other MOOCs. Figure 6 depicts users' reasons as a percentage distribution for various disciplines. The two frequently cited reasons for pursuing MOOCs

across all disciplines are [to] 'Explore New Domains' and 'Your College or Instructor encouraged'. As a result, no contrast or meaningful pattern could be discerned for comparative analysis. Therefore, these two reasons have not been considered for the study.

The analysis found that Database Management Systems (DBMS) courses and Programming courses (which include Python, C and C++) have a higher percentage of users who selected '*Campus Recruitment*'. The students are pursuing NPTEL to learn the technical skills required for jobs. Which, apparently, their college is failing to provide.

Professional Communication courses have a higher percentage of choosing '*Mandated by College*' and '*Credit Transfer via College*' for all disciplines of the study. The analysis also indicates a significant increase, from 6% in 2018 to 18% in 2019, for credit transfer. This increase indicates that colleges are gradually increasing the use of NPTEL courses as substitutes for classroom courses.

Among (Core) Engineering and EEE disciplines, '*GATE Preparation*' (an all-India postgraduate entrance exam) is one of the primary reasons students pursue NPTEL. This suggests inadequate learning in colleges, thus forcing students to rely on NPTEL.

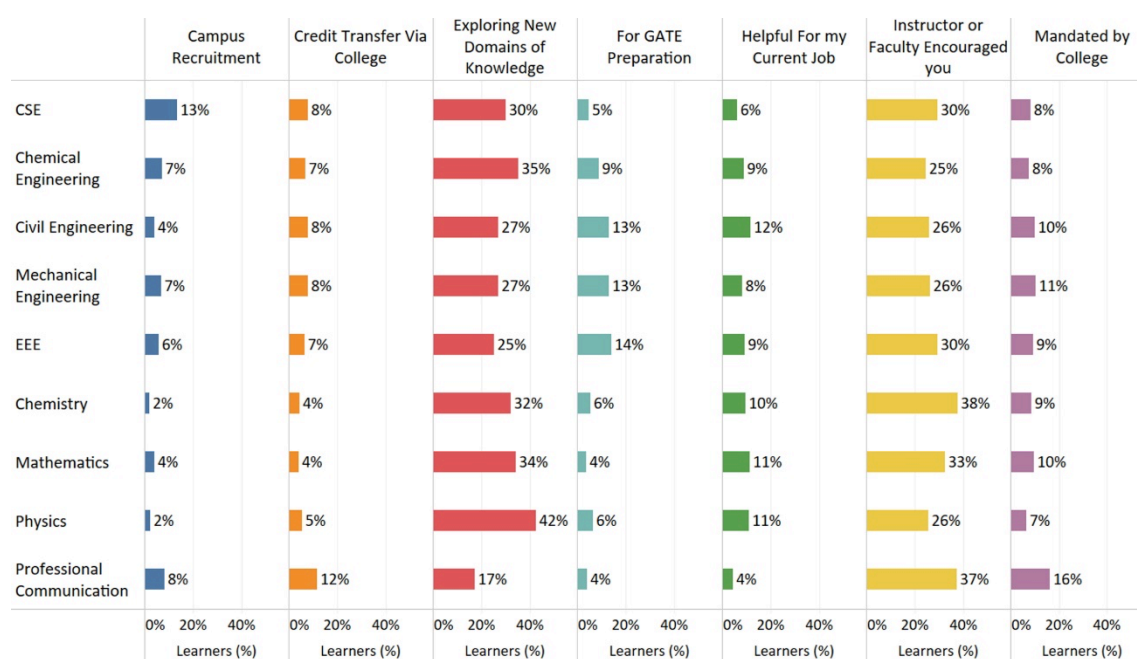


Figure 6: Reasons for using NPTEL as selected by the Users

#### 4.6 NPTEL/SWAYAM Policy in Colleges and Universities

Several universities and colleges have embraced the SWAYAM policy in their technical education program. For example, Dr. A.P.J. Abdul Kalam Technical University of Uttar Pradesh and the Maulana Abul Kalam Azad University of Technology of West Bengal are offering students an incentive of an Honours degree in Bachelor of Technology if they complete additional 20 credits from NPTEL. They have also mandated first-year students to complete Professional communication courses from NPTEL (AKTU, 2018; MAKAUT, 2018). Jawaharlal Nehru Technological University Hyderabad of Telangana and the Sri



Venkateswara University of Tirupati are running elective courses via NPTEL (JNTU, 2018; SVUCE, 2020).

We conducted surveys with students to ascertain the extent of NPTEL policy acceptance and policy support offered by the colleges. Of over 500 students who responded to the survey, 365 (~70%) responded positively to the assistance provided by their institute to pursue NPTEL. Figure 7 shows the students' responses to five survey questions measured on the Likert Scale. The data highlights that most colleges and universities share information and motivate their students to register for NPTEL courses. The responses also show that faculty are helping students with their online assignments and clearing doubts. Universities and colleges also ensure that students are getting access to computer labs to pursue NPTEL courses. However, one in four students also raised the concern of no such support from their department or college.

All responses to the five questions were subjected to the Kendall Tau-b statistical test for the ordinal variable against a nominal variable: the type of college (public and private). The test showed a statistically significant result for responses to one question: providing financial assistance towards registration (Kendall's Tau-b= -0.107, p= 0.027). It shows that public colleges are more likely to provide financial aid to students than private colleges for NPTEL courses. Thus, questions the policy of using MOOCs as a solution to overcome the problem of equitable access to education.

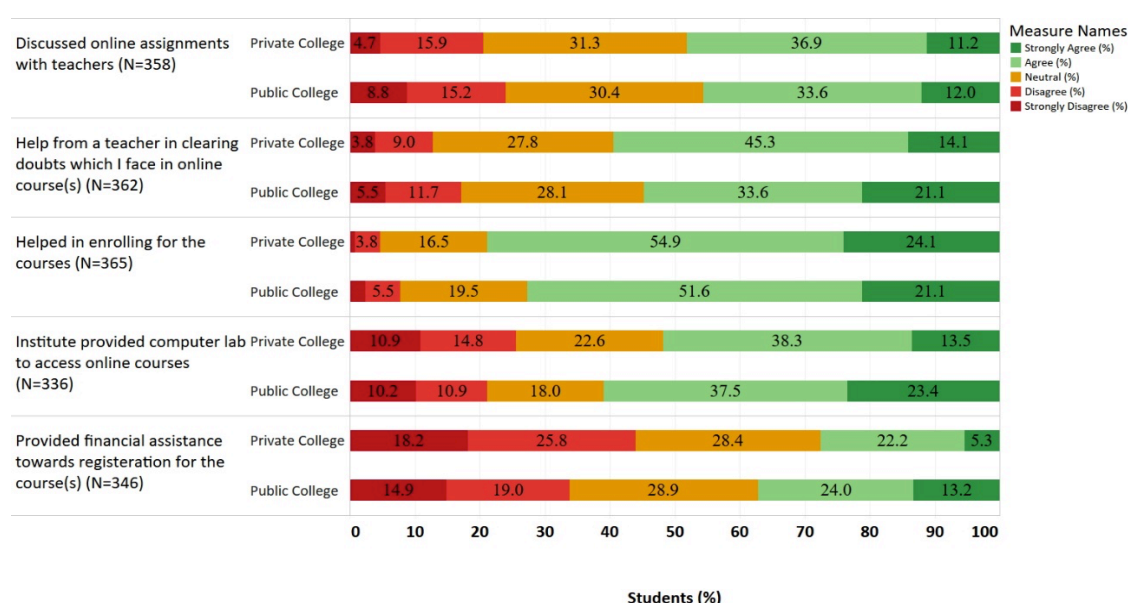


Figure 7: Response of Students of two type of colleges to NPTEL Policy support in their college

## 5. Discussion

The following sections will attempt to synthesise our analysis with observations on the use of MOOCs in engineering and sciences viz-a-viz policy on MOOCs.

## 5.1 Registration, Completion Rate and Impact of Duration

The analysis of NPTEL data reveals varying enrolment numbers across various disciplines. This observation motivated us to examine why CSE and Professional Communication courses have higher enrolment numbers than other engineering and science disciplines. The enormous number of learners enrolling in CSE courses indicates numerous students are pursuing these courses irrespective of their discipline. They are pursuing these courses to acquire skills for employability. Which is because of the increasing number of jobs available in digital technology (Nasscom, 2020).

The analysis highlights the difference between enrolment and registration numbers, akin to attrition rates, as observed in the various studies of MOOC providers (Franceschin, 2016; Jordan, 2014; Murray, 2019). We observed that Professional Communication courses have the highest registration rates among all disciplines. This is likely because several state technical universities have mandated Professional Communication courses from NPTEL/SWAYAM (AKTU, 2018; MAKAUT, 2018) in their curriculum. Ergo is reflected in the NPTEL data.

For NPTEL MOOCs, contrary to Jordan's finding (Jordan, 2015), the course duration does not play any role in the dropout rate. The drive to complete the course can be attributed to self-motivation, the desire to earn a certificate and the incentive of credit transfer on successful completion through the SWAYAM policy.

## 5.2 Users and their reason for pursuing NPTEL MOOCs

The NPTEL data showed that faculty and students are major users of NPTEL MOOCs. However, the percentage of faculty and students using NPTEL varies across various disciplines. Disciplines such as CSE and (Core) Engineering have a high percentage of student users, while Sciences and EEE have a higher percentage of faculty users. This raises the question of why Sciences and EEE have higher faculty users than CSE or Professional Communication courses.

Several reasons explain the higher percentage of faculty users in the Sciences, EEE and specific (Core) Engineering Courses. The first reason can be understood by examining the faculty's learning attitude towards their journey to becoming teachers. The teachers might not have acquired the competency required to teach the fundamental subjects of their respective disciplines. Therefore, course certification might be a recourse to attain the desired confidence level to teach the students and acquire professional competence (Hew & Cheung, 2014; Dillahunt et al., 2016; Watted & Barak, 2018).

The second reason for high faculty users pertains to their job requirements (Hood et al., 2015). The faculty may be using MOOCs to keep themselves abreast of the latest curriculum in their respective fields. This is reflected in specific contemporary CSE courses which have higher faculty participation (e.g., Data Science and Human-Computer Interface (HCI)).

The analysis of student data raises questions about the state of the higher education system. Students highlighting reasons such as, *'Your college or faculty encouraged you to enrol'* and *'Mandated by College,'* indicate the problem of quality faculty in the institutes. The syllabus documents of various institutes show that they mandate students to complete the courses



online and fulfil the degree requirements. There is also a possibility that colleges are offloading teaching responsibility by using NPTEL in regular curricula.

The reasons such as '*Campus Placement*' (for CSE) and '*Gate Preparation*' (for EEE and other Engineering disciplines) raise concerns about the standard of the colleges and the quality of the faculty teaching in such colleges. It also indicates the inability of the institutes to make students employable. Hence, students find NPTEL MOOCs an apt alternative to classroom teaching, making them employable.

### **5.3 Suitability of MOOCs to Engineering and Science courses**

The low registration and completion rates also question the adoption of specific disciplines in the MOOCs format. The analysis shows that learners find MOOCs courses of Sciences, especially Physics and Chemistry, challenging to pursue and complete in the online format. This is reflected in the low successful completion rate of Physics, EEE and Chemistry NPTEL courses.

There can be several reasons which explain the difficulty in completing MOOCs. The MOOCs might have pedagogical monotony, unfulfilled learning expectations from MOOCs, and low or no skill value compared to other courses (such as CSE). Therefore, educational institutions that see MOOCs as a technology to teach engineering and science courses must consider the suitability of courses and the socio-culture of the students (Bayne, 2015).

### **5.4 SWAYAM Policy in Colleges and Universities**

The SWAYAM regulation act empowers universities and colleges to substitute classroom courses with NPTEL/SWAYAM courses. However, the curriculum documents of several state technical universities and colleges reflect a more cautious approach. Such universities are running professional communication courses or elective courses in technical education via NPTEL (AKTU, 2018; JNTU, 2018; MAKAUT, 2018; SVUCE, 2020).

Our analysis mainly reflected positive feedback in assessing the enforcement of the SWAYAM policy from the student's perspective. The data from the survey indicates colleges are leaving no stones unturned to help students register for NPTEL courses. The students are getting support from institute faculty in clearing their doubts and assignments. Institutes are also providing students with computer labs to access NPTEL. This is especially beneficial to the students who do not have access to any digital infrastructure.

However, the SWAYAM policy is also facing a hurdle. The results showed that more public colleges provide financial aid to students to register for the NPTEL course than private colleges. This, inadvertently, is creating inequality in accessing NPTEL courses. Thus, depriving students of NPTEL policy benefits of certification and transfer of credits.

## 6. Conclusion and Future Scope

NPTEL/SWAYAM platform is a government-funded MOOC platform. It is perhaps the most extensive scale attempted by any public/national system in the world to enable the use of these courses in the regular curricula. In this context, our study will be helpful to those interested in designing and deploying massive digital education systems, especially state and public agencies.

Our study showed that the registration and completion rates are high for CSE and Professional Communication courses but not for Electrical and Electronics Engineering and Science courses. Thus, MOOC-based learning may not be effective in all disciplines of Science and Engineering. NPTEL allows users to select only one 'reason' while sharing their reason for pursuing NPTEL. However, in our opinion, multiple reasons affect the use of NPTEL, which the current NPTEL data does not reflect. The existing NPTEL data also does not consider students' learning environment conditions, such as classroom learning, institute infrastructure, etc. or external factors which may compel or motivate students to pursue MOOCs.

Even though our study is based on NPTEL MOOCs, there are other MOOCs platforms which Indian learners also use (Coursera, edX, Udemy, etc.). Therefore, further investigation is required to understand and gain insights into the MOOC ecosystem operating in India.

Our findings also suggest that further research is needed along two strands: (a) to ascertain how well the substitution of a MOOC for a classroom course work in science and engineering disciplines, and what kind of scope exists for the redesign of these MOOCs to make them more suitable for STEM subjects; (b) to evaluate MOOCs as a tool of policy intervention by the government in higher education - whether allowing MOOCs for credits actually works or not and are there are shortfalls in learning outcomes. Answers to these questions will suggest whether to curtail the 'for credit' idea or to make it even more pervasive.

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## Resources

Link for NPTEL data: [https://archive.nptel.ac.in/noc/noc\\_course.html](https://archive.nptel.ac.in/noc/noc_course.html)

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***Harnessing the Unspeakable: Effect of Using Creative Methodological Tools to Speak About Emotions in Higher Education***

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**Abstract**

In recent years, emotionality studies and emotional burnout has gained interest among researcher, especially while trying to understand emotions in the workplace. Many people are reluctant to share their true emotions or, in some instances, are unaware of the emotions they constantly feel while encountering difficult situations. Individuals are expected to ‘swallow’ their feelings in the workplace and only show positive emotions when faced with challenges. Ultimately, the notion of unspeakable emotions is unconsciously immersed into their practice. Consequently, this ethnographic study will explore faculty members’ day to day life situations in higher education, their emotional experiences, both negative and positive, and their physical environment. The process of helping faculty members speak about emotions involves three phases adopted from the phenomenological approaches to emotions. During the first phase, participants are asked to talk about their experiences using metaphors which helped them reflect on their emotional experiences. In the second phase, semi-structured interviews are conducted to understand their day-to-day practice. Lastly, during the third phase, participants are provided with images of the BLOB tree which helped them reflect on their emotional responses and occupational practice. This discussion is motivated by a desire to understand true emotional responses as experienced by the individual. The emphasis on understanding the daily lived experiences and emotions in higher education opens possibilities for providing better care and acknowledgment to both teachers and students. The findings show that creative methods in emotionality study yielded more emotionally charged responses from the participants.

Keywords: Emotional Burnout, Emotional Labour, Phenomenology

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## Introduction

Although the topic of emotion is gaining more recognition in Higher Education, most of the literature in this area has been concerned with the cognitive aspect of teaching (Butler, 2004; Cohen, 2011). The role of teachers' emotions and wellbeing in relation to the contextual practice seems to be gaining in recent years. There has been a growing body of literature in understanding the lived experiences and emotional responses of teachers (Kitching, 2009; Zembylas, 2011). Generally, people are more likely to refrain from speaking about emotions and feelings especially at their workplace. Previous research on teacher's emotionality has mainly explored negative emotions associated with teaching, guilt (Thomas, 2017), stress (Harmsen et al., 2018; Yin et al., 2019), fear (Mehmood, 2019), and anger (Frenzel et al., 2016). Few research studies examined how instructors in higher education feel in relation to the work environment (Mendzheritskaya & Hansen, 2019). The current study does not aim to examine emotions from a psychological, neurobiological, nor a clinical perspective. However, this qualitative study is more concerned with understanding the different ways to help teachers speak about emotions in HE besides exploring different factors that are more likely to contribute to their lived experiences.

## Literature Review

Ultimately, speaking about felt emotions is a challenging task, especially during interviews. In their mixed- method study of emotions among pre-tenure faculty members, Stupnisky, Hall, and Pekrun (2019) examined the relationship between faculty members' emotions and their teaching and research performance. The authors interviewed 11 faculty members and surveyed 102 others and identified 46 discrete emotions in relation to both research and teaching. The study highlights the importance of reflection on the role of emotions in higher education as a predictive measure of teaching and research performance of teachers. Accordingly, there is a dire need to acknowledge the individual feelings of faculty members in Higher Education to offer implications for faculty development. In their dual study of students' disruptive behaviour and its impact on teachers' occupational wellbeing, De Ruiter, et al., (2020) tested teachers' emotional responses in relation to specific classroom events themselves and the perceived history of the students' disruptive behavior. Their aim was to understand whether teachers' perceptions of the students' past disruptive behavior moderated teachers' valence appraisals (if the event was positive or negative) and teachers' emotions in response to a particular event. There were 218 teachers who took part in their first study in which one event was examined with the relevant students. In their second study, 37 teachers took part and multiple events were examined. Both studies concluded that teachers expressed negative emotions towards students they perceived as more disruptive in the past compared with students they perceived as less disruptive. the study also found that anger was the only emotion associated with teachers' occupational wellbeing. The findings are consistent with the current study in terms of the theoretical stance of emotions. Emotions in education is deemed crucial to pedagogical practices (Zembylas, 2011). Researchers to date utilized different creative methods to help participants speak about emotions. MIyanarzyk (2014) examined the effects of storytelling to bridge the gap between students' previous experiences and the type of structure expected from them by many college courses. In her study, she suggested that storytelling strategies in the writing classroom allow students to strengthen their communication skills and engage emotionally with the activities. Similarly, in her qualitative study, Gómez Palacio (2010) implemented storytelling, role play, and information gap activities which helped students improve their speaking skills and participation in class.



Accordingly, the Blob-tree tools used in this study help participants express themselves appropriately and use the conversations learned in their daily lives.

## **Research into Workplace Emotional Responses**

Daily demands of the work environment are more likely to act as stressors to faculty members which could in later stages lead to strain (Abenavoli, 2013; Woods & Carlyle 2003). For that reason, it becomes essential to understand the demands imposed on faculty members to understand their emotional responses to their contextual practice. Emotional burnout and lived experiences have been widely researched and it becomes the cause of concern especially in the field of education and faculty well-being (Greenfield, 2015; Kyriacou, 2011). Ultimately, it becomes essential to understand the small little things that impinge on teachers in the workplace. Drawing on Bandura's (1999) call for small life occurrences, people's lives are shaped by the incidental series of events that they encounter throughout the course of their day. To some extent, some of the critical life decisions we make rely on the insignificant little events that happen to us. Accordingly, the minor events we encounter, most likely at work, can have a crucial influence on our experiences and the way we feel, most specifically, our motivation to work. Several researchers distinguish between emotions felt in the workplace and cognition in which emotionality is often associated with irrationality. According to Sutton & Wheatley (2003) expressing emotions in the workplace is more likely to be considered "destructive, primitive, and childish, rather than thoughtful, civilized, and adult" (p. 328). It seems that this approach isolates the mind from the heart and emphasizes only on the physiological aspects of emotions without any references to cognition or thinking (Marom & Tarrasch, 2015). On the contrary and in line with this study, Wells and Claxton (2002) suggest that emotional experiences and responses are determined by social interaction with others. Ultimately, the current study is informed by the social constructionist approach to emotions which perceives emotions as socially interactive and constructed by human interaction.

## **Definition and Classification of Emotions**

It is rather difficult to pin down one definition of emotion due to the superfluity of definitions available in the literature (Chen, 2016). Heretofore, there was still not one agreed upon definition of emotion among researchers which created confusion in the field (Reisenzein, 2007). Social constructionism approaches to emotions suggests that teachers' emotional responses are more likely to be derived from power relations are socially constructed by the social and political contexts of the participants. In that case, emotions are molded by social constructionism in which they are mainly shaped by society and culture (Aranguren, 2017). Therefore, the approach to emotion in this study is informed by Averill's (1985) full definition which states that an emotion "is a transitory social role, a socially constituted syndrome, that includes an individual's appraisal of the situation and that is interpreted as a passion rather than as an action." (P. 312). In his definition, Averill (1985) emphasises that the individuals' appraisal of a situation and their interpretation is what constitutes emotions. In the same vein, Zembylas (2003) considers emotions as not only an innate disposition but also political and social phenomena that are constructed by the individual's own work. This socially constructed view of theorising emotions is a fundamental part in any professional context, and in this case, higher education. Accordingly, emotions are inevitably viewed as the individual's response to political, cultural, and social practices. In most cases, venting out emotionally especially in the workplace is often stigmatized, and an employee who is always emotional is more likely to come across as inadequate and unprofessional.

## Methodology

### Current Study Design

The aim of the present paper is to gain a deeper understanding of teachers' emotional responses using the Blob-tree creative methodological tool. Consequently, this ethnographic study explores faculty members' day to day life situation, their emotional experiences, both negative and positive, and their physical environment. The field of ethnography originated from anthropology as a way to account for social lives and cultures and means "the study of people" (Howell, 2013, p. 120); *ethnos*, in Greek, means 'people,' and *graphy* entails studying a particular phenomenon. In that sense, ethnography emphasises the study of culture, language, and the interaction of members in that specific culture (Creswell, 2013). According to Hammersley and Atkinson (2005), ethnographic research design has become popular in social research as an opposition to the positivist research approach. In the long history of ethnography, it has acquired many different definitions. Hammersley and Atkinson (2005) define ethnography as a field that entails the "ethnographer participating, overtly or covertly, in people's daily lives for an extended period of time, watching what happens, listening to what is said, asking questions – in fact, collecting whatever data are available to throw light on the issues that are the focus of the research" (p. 1). This definition has been adopted in this study, since the main aim is to have a close approximation with the participants through participant and non-participant observation, which are the main tools used in this research, in an effort to arrive at a full understanding of teachers' experiences, culture, and emotionality. In doing ethnography, the researcher develops an understanding of people's actions by observing them in their own communities and environments in order to interpret their values, beliefs, and ways of living (Hammersley & Atkinson, 2005).

### Philosophical Stance

The current study adopts an interpretive framework, which aims at understanding people's realities from their own perspective and acknowledges that people's realities differ based on their subjective experiences (Cohen, Manion, & Morrison, 2017). Interpretivism does not hold a rigid way to seek answers for their questions, however, it's an approach to explore reality from the perspective of their subjects. This anti-positivist approach suggests that research is approached subjectively from the inside; through individuals' direct experiences rather than being objectively approached from the outside (Cohen, Manion & Morrison, 2017). Most theories constructed under the interpretivist paradigm draw between the inside-outside, so those who are in the same setting may experience the social reality in a different way (Cohen, Manion & Morrison, 2017). However, interpretivism has been criticised for subjectivity, which plays a major role in interpretivist research where the researcher can become greatly biased during the interpretation of data (Cohen, Manion & Morrison, 2017). This philosophical stance is evident in studies of emotions based on a relativist ontology. Willis (2007) argues that individuals act in certain ways and are influenced by their environments. The meaning of the world according to the person is a crucial aspect in understanding a particular phenomenon. The interpretivist framework provides the context to explore teachers' interpretations of their own experiences in higher education. The aim of interpretivist research is in line with the current study objective since it aims to understand a particular phenomenon rather than explain it. Semi-structured interviews and creative methodological sessions are utilised in the study to better understand the challenges and stresses that faculty members encounter during their course of study and allow the

interviewer an opportunity to view the phenomenon from the interviewer's standpoint (Bryman, 2015).

## Selection and Sampling

A sample of eight faculty members in higher education, randomly selected, took part in the study. Due to the density of the data generated and the nature of the ethnographic study, a small sample size was deemed appropriate. The following table presents the study sample demographics.

*Table 1: Demonstration of the study sample demographics*

Pseudonym	University	Age	Overall teaching years	Years of experience	Marital Status	Children
<b>Rawan</b>	Baa	45	26	11	Married	3 daughters
<b>Maya</b>	Lam	NP	9	NP	NP	NP
<b>Nuha</b>	Meem	NP	15	5	Widow	2 sons
<b>Faten</b>	Meem	52	15	19	Married	4 children
<b>Hayfaa</b>	Lam	NP	10	10	Married	triplets
<b>Nabil</b>	Aleph	45	26	12	Married	6 children
<b>Nabila</b>	Dal	39	15	9	Married	2 children
<b>Ghazi</b>	Jeem	NA	22	12	Married	NA

## Data collection Procedures

Ethnography uses a 'toolbox' of methods to extract data from the setting. In this study, elements of phenomenology were utilised to generate data related to participants' emotional responses. Edmund Husserl in 1900 is the founding father of the philosophy of phenomenology which is regarded as the positivist approach in qualitative research due to its systematic approach. Husserl's philosophy emerged as a criticism to the field of psychology that aims to relate human issues to natural sciences as individuals do not react to stimuli spontaneously (Shahabi & Rassi, 2015). Seidman (2013) suggests the phenomenological interviewing which is comprised of three- interview series, to help the researcher delve deeper into the area being studied and to establish rapport and trust with the participant. In this study, the first interview establishes the context of the participant's experience and builds rapport. I have used the metaphorical imagery with the participants in which they were asked to find an image that symbolizes their experience in teaching. Semi-structured interviews were utilized during the second interview which allow participants to recreate the details of their experience within the context in which it occurred. During the third and final interview, the Blob-tree tools were utilized and since rapport was established at this stage, participants reflected on the meaning of the experience and generated emotionally charged data.

The Blob tree (See Image 1) was mainly used in this study to help participants articulate their emotions and reflect on their experiences in higher education. The Blob Tree was created in the early 1980s by Pip Wilson and Ian Long to communicate with individuals who found reading difficult; it is a no-word tool, relying instead on expressions and figures (Wilson & Long, 2010).



Image (1): Example of a Blob Tree tool

## Data Analysis Procedures

Interviews were recorded and transcribed. The Blob-Tree transcripts that were conducted during the third interview session were collected and analysed. The Blob-tree sessions were mainly conducted to help faculty members speak about their emotions in depth. The objective behind using the tools was to arrive at an in-depth understanding of faculty members' experiences in Higher Education. According to Lester, Cho, and Lochmiller (2020) interpretation of one's data is as much art as science. It is a process, much like writing, that is both invisible and difficult to describe. There are no set procedures to follow and no "right" way to analyze the data. Accordingly, I have only used the word document to analyse and interpret data. As I was sketching possible codes, I found myself drawing a spiral maze, *Labyrinth*, around the participants, with one exit route and many obstacles and probably triumphs paths. Image (2) demonstrates an example of the *Labyrinth* developed for each participant. The center of the Labyrinth signifies the felt emotion and the code generated from the Blob-tree session, and moving outwards are the social factors impinging on the emotion. The exit path from the spiral maze is the coping strategy used by the faculty member.

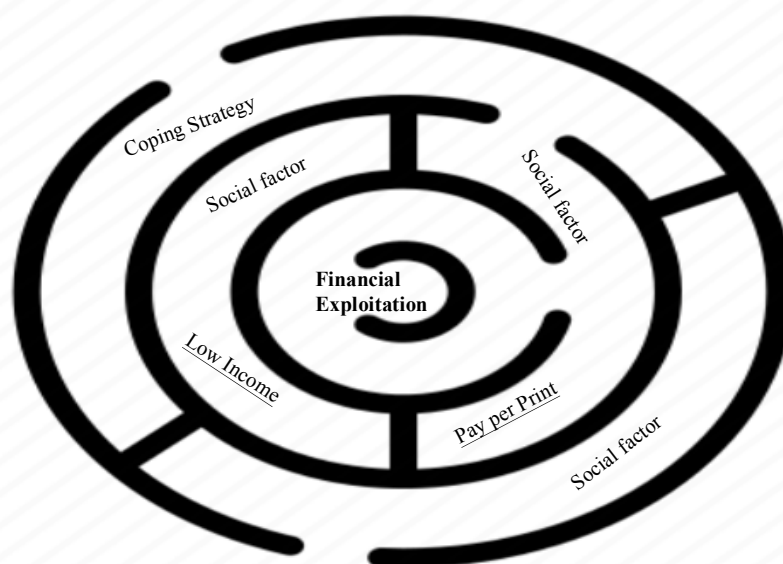


Image (2): The Labyrinth which includes the codes that emerged from each participant

I drew on this metaphor of labyrinth to understand the messiness and complexity of the data which helped me conceptualize the daily lived experiences of the participants. This visualization in fact concludes that the codes, categories and themes generated were actually

emotional responses that were impinging on and shaped the daily lived experiences of faculty members in higher education.

## Findings

The present study investigated the emotional responses of faculty members in higher education. Teachers were asked to reflect on their daily lived experiences in higher education. During the first interview series, teachers found it difficult to find metaphorical imagery to symbolize their experience. However, the photos they selected helped establish the context of their experience. The analyzed data revealed that the participants elaborated more on their experiences during the Blob sessions and their discourse was more emotionally charged than the semi-structured interview session. It seems that photo elicitation techniques generate a different kind of information as it evokes feelings, memories, and in-depth information (Harper, 2002). Table For example, Table 2 demonstrates the difference in the discourse between data generated during the semi-structured interview session and the Blob-tree session in relation to *financial burden* code.

Table 2: Demonstration of the code Financial Burden

Data	Data Source	Code
I [had to] get [my own] new printer, even [...] the ink [because] I often, daily, [print] worksheets for them. [...] I print my [own] exams, my quizzes. [...] I do this because I want to do it.	Semi-structured interview	Financial Burden
This is me holding to the tree. I feel that the school is mine, everything there is mine. I don't need anyone or anything. I bought everything. Sometimes I feel I am trapped in the school; I get angry or maybe sad to spend all that money.	Blob Tree	Financial Burden

The table above clearly shows the discrepancy between both data sets. Participants were reluctant to reflect on their true emotions during the semi-structured interview sessions. It is also possible that some participants find it difficult to express their emotions during formal interviews. Visual methods enabled me to engage the participants in somewhat uncomfortable conversations about emotions and teaching. Ultimately, participants found it also easier to speak about their true emotions in relation to their relationship with management during the Blob-tree sessions. Table 3 below demonstrates the difference in the discourse between data generated during the semi-structured interview session and the Blob-tree session in relation to *Interpersonal relationships with others* code.

*Table 3: Demonstration of the code Interpersonal relationships with other*

<b>Data</b>	<b>Data Source</b>	<b>Code</b>
I I feel that I am somewhat happy with management yeah, they care for us, support it, [they are] so tough like they won't upset us much	Semi-structured interview	Interpersonal relationships with others
I am that Blob frowning. Sometimes I run to the toilets and cry, our head of department will not care if you are overloaded, maybe communication is a problem as well. I am [frowning] because I have no control over the classes I want to teach.	Blob Tree	Interpersonal relationships with others

The table above represents two data sets generated by the same participant. All participants in the study did not want to reveal negative emotions about their superiors. Speaking openly about emotions is not an easy task and requires multiple encounters with the participant to be able to speak about private and intimate feelings. Conversely, using creative methodological tools like the Blob Tree method proved to be successful to make participants connect with their emotions and produce emotionally charged sentences. Table 4 also demonstrates the different data in both settings.

*Table 4: Demonstration of the code Physical Environment*

<b>Data</b>	<b>Data Source</b>	<b>Code</b>
The university is my second home, I can't tell you which part I like the most, but I feel [that] I miss it when I go away on holidays.	Semi-structured interview	Physical Environment
I am this [Blob with a sad face] because you know sometimes I feel that I deserve that classroom conditions become better, I like to have a nice office the one I have is without even a window.	Blob Tree	Physical Environment

The study's participants also commented on the lack of appreciation at the workplace. The discrepancy in the data generated is consistent with all eight participants and throughout all the codes and themes. The findings of the study suggests that visual methods and creative methodological tools are recommended for research into emotional responses and lived experiences especially in one's workplace, since individuals are more likely to fear exposure of their real thoughts and feelings to upper management.

## Discussion

The current study offers a way of examining the creative tools in educational research as an effective method to speak about emotions. The use of visual methods has recently become

popular in different ethnographic studies (Russell, 2007; Thomson, 2008). Russell (2007) suggests that careful consideration needs to be given to utilising visual methods in school ethnographies. The use of visual methods has been criticised by social scientists as ambiguous and open to subjective and biased interpretations (Frith, Riley, Archer, & Gleeson, 2005). Similarly, the naturalistic approach that emphasises objectivity in observing participants' situations and interactions regards the use of images in qualitative research as an unreliable source of inquiry (Russell, 2007). According to Pink (2007), the implementation of visual ethnography requires the researcher to be well-equipped and to expect that throughout the study, new visual methods may be deemed crucial to utilise. The use of creative methods can encourage conversation and may be deemed useful during interviews (Russell, 2007). The use of creative data collection tool helps in establishing a rapport with the participants and eliciting more thoughts and information that would be missed with informal or formal interviews.

## **Conclusion**

In most ethnographic research, the events in naturalistic settings are difficult to be reproduced and the findings are only applicable to that group understudy, unlike controlled settings where researchers can control research variables (Nurani, 2008). In that sense, the aim of this study is not to generalise the findings to a wider population but only to understand the factors that contribute to the emotionality and experiences faculty members in higher education who share some characteristics. This limitation can be minimized by utilising triangulation to ensure the credibility and trustworthiness of the constructs used in the study. Despite the limitations of the ethnographic study, a major advantage of the study is to record participants' behaviour and emotional responses as it occurs in the natural setting, provides a holistic description of the phenomenon within the community, and to understand the phenomena understudy from the perspective of the participants (Nurani, 2008).

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***Youth Agency: Raising Awareness of 21<sup>st</sup> Century Global Citizenship in Higher Education***

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**Abstract**

The world has become a place where individuals are expected to acquire certain skills and competencies to keep up with the speed and nature of changing circumstances and adopt conscious and responsible attitudes to become an active part of change. Being an agent of change in the 21<sup>st</sup> century, a time characterised by environmental and economic havoc, entails a new understanding of citizenship. An increasing number of university courses are being designed to make the young generation more aware of their potential to become civically engaged in social matters. This study employs a qualitative case study which explores changing perspectives of undergraduate students on global citizenship and how they define their role as agents of social change and progress. The authors draw attention to Education for Sustainable Development (ESD) to demonstrate how the notion of youth agency is redefined through educational practices and new approaches to learning in higher education. Introducing undergraduate students to Sustainable Development Goals (SDGs) of the United Nations (UN) and encouraging them to lead discussions and propose solutions about the existent problems of their country are among the main objectives of the course. The fundamental value of global citizenship becomes more clear when its role in redefining youth agency is considered.

Keywords: Global Citizenship, Agency, SDGs, Sustainability, ESD

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## Introduction

Youth agency can be characterised as the willingness of young people to make decisions and initiate social change. Young people's agency may be manifested through multiple forms of behaviour such as resistance, volunteerism, and involvement in Non-Governmental Organisations (NGOs). Geographical and social factors closely affect the rate young people are involved in social life. Social institutions like family, school, and state are important determinants of how the youth define and value themselves. The dynamics in the family, state policies and educational practices regarding the welfare of the youth are all influencing factors in the development of agency. Therefore, educational institutions of all levels including higher education have a critical role in equipping the youth with required knowledge and skills to contribute to their understanding of the significance of agency. Initiating a youth agenda, prioritising the welfare of the young population and addressing their changing needs especially in the 21<sup>st</sup> century will undoubtedly enable young people to define themselves as conscious and respected citizens of their communities. What is highlighted in this paper is one dimension of this effort, namely the contribution of new educational practices in higher education to the redefinition of young people as responsible citizens.

## Theoretical Framework

### *Global Citizenship/Active Citizenship as a New Concept and Youth Agency*

The 21<sup>st</sup> century notion of citizenship encompasses a new understanding which is associated with social engagement of individuals within an inclusive society. The changing focus towards citizenship that necessitates full participation and collaboration has led to the emergence of new approaches to citizenship definitions. The necessity to fully participate in the social, cultural, economic and political life of a country has initially arisen as a challenge for individuals who do not yet define themselves as active citizens. For them, as Percy-Smith asserts, citizenship cannot be practised only through everyday activities (2015). With the increase in academic research about youth studies, a need to conceptualise notions like identity, agency and selfhood has also emerged. This has led to many important changes in various spheres of life as well. Educators, for instance, have seen it necessary to redefine their course objectives in line with the needs of the young generation. Policy makers have to adjust their welfare policies in order to foster inclusion of young people as socially engaged, responsible citizens of the country. All these attempts underline agency as an important component of identity. In other words, youth agency has become a means for young people to define who they are.

Agency is defined as “the strategic making and remaking of selves, identities, activities, relationships, cultural tools and resources and histories, as embedded within structures of power” (Moje & Lewis, 2007, p. 18). Youth agency refers to the willingness and decisiveness of young people to be part of the change. The critical question here is how young people have a sense of agency and how this, in turn, helps them participate in the social life of their culture and become agents of change. The agency of young people is determined by various factors such as family, education environment, socioeconomic conditions and culture. Being raised in a family restricting or encouraging self-expression and having or not having access to varied learning experiences can be counted as influential factors in agency. Since the focus of this paper is an evaluation of youth agency in a higher education context, the discussion will revolve mostly around educational practices that foster youth agency.

In her article “What is Student Agency and Why Is It Needed Now More Than Ever?”, Vaughn (2020) examines student agency through examples of good practices at schools that cultivate the agency of their students. Associating student agency with three dimensions, namely dispositional, motivational, and positionality of individuals, Vaughn (2020) underlines that the quality of education depends on the interaction among certain components of education. In other words, student agency is determined not only by teacher-student interaction but the role of school leaders, policy makers, and teacher educators also matter. Vaughn also points out that agency is “co-created” in a school environment with the guidance of teachers and peers. What is critical in the creation of agency is the role course curriculum, assessment choices, and student participation play. Rather than formalising education in the conventional way of delivering lectures to a class of students listening to the lecturer passively, allowing students to demonstrate their agency during courses guarantees a more fulfilling learning experience. Courses that foster creativity and critical thinking skills of students enable them to develop different perspectives and a more liberating mindset whereas tasks that necessitate group work and thus collaboration make them more aware of their strengths and weaknesses. Conceptualization of student agency, in this respect, entails viewing students as “entrepreneurial”, “generative”, and “choice-making” individuals (Tran & Vu, 2018; Vaughn, 2020).

Evaluating youth agency in a classroom context necessarily includes a full understanding of student agency, yet research on the agency of young adults has shown that youth agency is a broader concept encompassing youth participation in social projects, active engagement with social issues, and commitment to contributing to the efforts for social development and sustainability. Just as educational institutions like schools and universities play a major role in their students’ development of agency, public institutions and states have a significant effect on young people’s being accepted as active citizens of their countries. Youth is perceived as “a transitory stage from childhood to adulthood” (Yılmaz, 2017) and it is situated “in a binary category” referring on the one hand to their “vulnerable” personalities and on the other hand their potential to contribute to public welfare (DeJaeghere, McCleary & Josić, 2016). It is then highly important to understand how educational research conceptualises the notion in order for institutions to foster agency. Since youth occupy a transitory stage and find themselves in a continuous struggle to define their identities, goals, and aspirations in life, it is necessary to evaluate youth agency in line with the realities of their life. Changing social conditions of each country and cultural environment determine how young people are in the social and political life of their countries. For any educational activity aiming to develop agency, it is obviously necessary to take these changing constituents into consideration. Young people who can find the opportunity to understand their roles as active and responsible citizens of their countries develop agency and a complete sense of identity. Courses that focus on social issues of the world create a ground for university students to critically evaluate and understand contemporary debates on global problems and the need for sustainable development. It is even more important if such courses foster youth agency to a certain extent that encourages young people to take an active role in the decision-making mechanisms of public institutions and organisations.

### ***Sustainable Development Goals and Education for Sustainable Development (ESD)***

University courses that introduce global issues pertaining to social development provide opportunities to develop consciousness about sociocultural dynamics of a country. Furthermore, the emphasis of such courses on agency makes young people aware of their priorities and redefine their future plans. Courses designed with a particular purpose to create

the necessary “supports and conditions that allow them to pursue what they value” (DeJaeghere, McCleary & Josić, 2016, p.13) enhance the agency of young people by making them aware of their potential contributions for public welfare. With their emphasis on global issues and creative solutions for sustainable development, ESD courses play a critical role in fostering youth agency. Since educators have the chance to confront their students with contemporary issues of the world through a comprehensive sustainability-oriented curriculum, schools and universities function as educational settings that raise awareness of and a sense of responsibility for societal problems. Declaring 2005-2014 as the Decade for Education for Sustainable Development, UN defines ESD as such:

ESD equally addresses all three pillars of sustainable development - society, environment and economy - with culture as an essential additional and underlying dimension. By embracing these elements in a holistic and integrated manner, ESD enables all individuals to fully develop the knowledge, perspectives, values and skills necessary to take part in decisions to improve the quality of life both locally and globally on terms which are most relevant to their daily lives.

Conceptualising sustainable development as a multi-dimensional principle of social life, UN highlights the role education plays in promoting equality, conscious consumption, decent work, and human rights. Moreover, the necessity for collaboration among educational institutions for the integration of ESD within the mainstream education policy of countries also goes hand in hand with the UN 2030 agenda and its focus on partnerships among institutions. This UN initiative to integrate the notion of sustainable development in the education policy of countries has obviously led to an increase in the number of courses specifically designed around the concept of sustainable development. The efforts to integrate sustainable development in education have so far resulted in the creation of new curriculums and education programs in elementary and secondary schools. Through these new adjustments, particularly secondary school students are expected to have an understanding of ecological, political, economic and social issues. In higher education; however, the emphasis on sustainable development has not been a mainstream policy yet and the number of universities providing bachelor's degrees is limited to a few (Venkataraman, 2009). SDGs are rather used as a roadmap by many universities to prepare their curriculums and plans. The University of the West of England, Bristol, and Okayama University for instance, have embraced the SDG agenda and adjusted their faculties and activities with an aim to contribute to the 17 SDGs (Nhamo & Mjimba, 2020). With respect to research on SDGs in higher education, there is an abundance of case studies and research demonstrating how new practices in higher education contribute to the realisation of Sustainable Development Goals. The International Journal of Sustainability in Higher Education publishes significant cases and the findings of research projects from all around the world to show how implementations and practices in higher education encourage new innovations and positive changes. To exemplify a few, Ferguson and Roofe (2020) analyse the importance of higher education in the realisation of SDG 4 by explaining how the University of West Indies School of Education leads the SDG4 agenda with its education practices. Another example is Dalla Gasperina, Mazutti, Brandli, and Rabello's case study (2022) that demonstrates the effects of smart campus practices in a Brazilian university. The University of Strathclyde's integration of “research-based education for sustainable development” (Strachan et al., 2019) is another important example that testifies the social impact of SDG focus in higher education practices. In this respect, the value of this study conducted in Türkiye is that it also provides a positive example to the integration of an SDG-related undergraduate course at a state university. What

makes the study novel is its particular focus on the relation of the course to the development of youth agency and SDG awareness within the young population.

## **Methodology**

The purpose of the study is to explore undergraduate students' changing perspectives of global citizenship and how they define their role as agents of social change and progress. The research design of the study is a qualitative case study, which is defined as "...an intensive study of a single unit or a small number of units (the cases), for the purpose of understanding a larger class of similar units..." (Gerring, 2006, p. 37). The research was conducted at a large state university in Türkiye, where a new and innovative course has been integrated into the curriculum to enhance the students' academic English skills through content concentrating on SDGs and conducting course delivery and assessment with a specific focus on 21<sup>st</sup> century learning skills. In accordance with ethics regulations, permission was received from the ethics committee of the University where the study was conducted. The participants were asked to sign a consent form and no incentives were given.

## ***Data Collection and Analysis***

In the study, data was collected through one-to-one semi-structured interviews through an interview form, which comprised 5 demographic and 9 open-ended questions. According to Hammond and Wellington, the interview is valuable because it allows the researcher to delve further into an interviewee's "thoughts, values, feelings, and perspectives" in general. In semi-structured interviews, the same set of open-ended questions is asked to each participant, but the interview can go in unexpected directions, which was the case in the current study. (2021, pp. 109-110). The results of the semi-structured interviews were analysed through thematic analysis (Krippendorff, 2004). Thematic analysis is used with qualitative data for locating, analysing, and interpreting patterns of meaning or themes, which are built on the foundation of codes, anchored by common concepts enabling the researcher to organise the data within a framework (Clarke & Braun, 2017).

## ***Study Group***

The study group of the study was determined through purposeful sampling since "it involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest" (Cresswell & Plano Clark as cited in Palinkas et al., 2016). Accordingly, 18 freshman level students studying in a range of departments in the same university participated in the study. Demographic information of the participants is illustrated in Table 1 below:

	Department	Age	Year	Gender
<b>Participant 1</b>	Industrial Design	22	Freshman	Male
<b>Participant 2</b>	Control and Automation Engineering	20	Freshman	Male
<b>Participant 3</b>	Mathematics Engineering	19	Freshman	Female
<b>Participant 4</b>	Molecular Biology & Genetics	19	Freshman	Female
<b>Participant 5</b>	Electrical Engineering	19	Freshman	Male
<b>Participant 6</b>	Mathematics Engineering	18	Freshman	Female
<b>Participant 7</b>	Mathematics Engineering	19	Freshman	Male
<b>Participant 8</b>	Meteorological Engineering	19	Freshman	Female
<b>Participant 9</b>	Control and Automation Engineering	21	Freshman	Male
<b>Participant 10</b>	Electrical Engineering	19	Freshman	Male
<b>Participant 11</b>	Economics	19	Freshman	Female
<b>Participant 12</b>	Metallurgical and Materials Engineering	19	Freshman	Male
<b>Participant 13</b>	Control and Automation Engineering	19	Freshman	Male
<b>Participant 14</b>	Geomatics Engineering	19	Freshman	Female
<b>Participant 15</b>	Environmental Engineering	19	Freshman	Female
<b>Participant 16</b>	Electrical Engineering	19	Freshman	Male
<b>Participant 17</b>	Urban and Regional Planning	19	Freshman	Female
<b>Participant 18</b>	Geophysics Engineering	20	Freshman	Male

**Table 1.** Study Group

## Findings and Discussion

The following themes emerged from the face-to-face interviews with participants.

### *Youth Interest Focus*

With regard to the focus of the youth in the scope of agency concerning sustainability, a majority of participants conferred concepts related with environmental sustainability such as recycling, ecology, energy sources, industry, clean environment, consumption, liveable world, green, life, nature, ecosystem, and renewability. Fewer number of participants mentioned concepts related with social sustainability referring to such specific concepts as equality, ideal order, continuity, consciousness and collaboration. Some touched upon the importance of global citizenship as seen in the following quote: “Being a world citizen...there are no boundaries between countries now. We have access to more people by



means of the internet but this also leads to harm in the natural environment. Being a world citizen accordingly means becoming aware of all these and doing something for the environment”. [Participant 4]

According to participants, the current era requires the interest focus of the youth in fulfilling the necessities brought along with its offerings. Within the scope, participants prioritise the issues of the current era as global warming, clean water, clean energy sources, consumption, climate change, access to basic necessities, education, equality, justice and peace. Also, thinking globally, intercountry collaborations, awareness of and sensitivity about SDGs, conscious citizenship to turn the world into a better place and virtual citizenship are prominent concepts as expressed by participants. However, some considerations are articulated regarding the increase in responsibility brought by the current era; as alleged in the following quote: “We have access to a vast quantity of information but this has also brought a great many responsibilities. We have seen that a global issue has influenced all of us. We need to have a command of several topics, have the ability to inform ourselves and people around us being knowledgeable about world issues”. [participant 5]

Concerning the youth interest focus, the role of education has been underlined as well. As asserted by participant 17, “Educated people have awareness regarding those concepts. It is of utmost importance to educate others so that they can understand us when we discuss such issues”. [participant 17] Also, the importance of knowledge dissemination throughout wider populations has been indicated as an influencing factor in raising and forming collective consciousness. “I can use these skills in my own life, for example while following daily news or while doing assignments for school. A university student needs to be engaged in a number of disciplines and be able to apply a multidisciplinary approach. I know I cannot do much alone for global issues. It will be influential only when everybody is equipped with these skills”. [participant 4]

### ***Youth Awareness***

The world we live in necessitates global knowledge and particular skills to keep up with the speed of changing circumstances in terms of environmental and societal issues. In many participants’ discourse in the current study, being aware of global issues and thinking globally have been stated as the most critical traits of the current era, which was characterised by participant 8 as “a dynamic century where everything is fast not only in our country but also across the world as the Z generation. Technology and its blessings are recently settling; a transition period where we are evolving into technology and we are aware of more thanks to social media”. [Participant 8] Surplus of information and the relative ease in accessing information compared to previous times have also been mentioned as constituent features of the current era, which requires increased consciousness in the youth not only to subsist but also to make a contribution. Therefore, many participants expressed the significance of awareness and conscious citizenship with regard to integration with the nature, societal challenges, consideration of global issues from different perspectives and knowledge of SDGs, as prioritised by participant 9 as: “...having knowledge about SDGs, being conscious to embellish the world and taking responsibility”. [Participant 9] Thinking that awareness about civic and political issues is a prerequisite for engagement, young people in this study are observed to have the basic information regarding contemporary issues. Defining engagement as a “cognitive process that implies the assumption of awareness towards civic or political matters”, Bee and Kaya (2017) differentiate engagement and participation. While engagement is cognitive, participation is “behavioural”, which indicates the necessity to take

active part in these matters. Regarding youth awareness, the participants are observed to be engaged in global issues to an extent that will help them define their role as active citizens. In the scope of youth awareness, participants in the study also draw attention to the importance of guidance and support from older generations in raising their awareness and room for development.

It is a fact that education has a critical role in contributing to youth awareness and consciousness about global issues. In this regard, the participants discuss the role of education concentrating on a specific course designed to raise their awareness about world issues with a particular focus on SDGs and how they started to realise the activities conducted in the specific field while enhancing their knowledge through research assignments. Although some of them stated being familiar with a certain number of SDGs, the focus of education on the issue increased their understanding in terms of the need for knowledge sharing across the world, the range and kind of issues, and methods of solutions that have been applied so far. As participant 7 explains: “I asked questions to myself that I had never asked before about our planet and its future”. [participant 7] Participants highlight that they now have widened perspectives about world issues and they adopt a more analytical approach towards those issues. “Almost none of us were aware of the SDGs. We were not expecting it as the title of the course was different. Our interest has increased also thanks to our instructor’s teaching methodology. Speaking for myself, I have learned a lot”. [Participant 18]

### ***Youth Active Engagement***

In the scope of active engagement, participants mention taking and fulfilling responsibility being part of the society, sensitivity for surrounding challenges, being part of the decision for country of citizenship, appreciating as well as criticising, engaging with and trying to find solutions for societal issues not only in the country of origin but also across the world. As indicated by participant 11, “Be knowledgeable about and responsive to events taking place around the immediate context, be able to react and take actions”. [participant 11] Within this framework, a majority of participants highlight the significance of youth contribution for the efforts made for a more sustainable world, as discussed in the following quote: “Most of the contribution will come from the youth indeed. We are recently becoming aware of issues. We will be constructing the jobs of the future”. [participant 6]

In line with perceptions regarding active engagement, a majority of participants involved in the study also mention the importance of taking part in a Non-Governmental Organisation activity and civic engagement, some pointing out their engagement as in the following quote: “I had volunteered for TEMA (Turkish Foundation for Combating Soil Erosion) and I have completed 5 basic modules of AFAD (Disaster and Emergency Management Presidency) online. In the future, I would like to work for Darüşşafaka”. [Participant 5] and some stating reasons for not being involved so far and their will to do so, as put forth by participant 14: “I have not been involved in such an activity so far but I would really love to. I have not had the opportunity. I have visited orphanages and nursing homes with my family”. [Participant 14] The study has revealed that young people have a satisfactory level of awareness about global issues and willingness to be a part of NGOs; however, their active participation in NGOs has been to a limited extent due to various reasons as opposed to what Erdoğan and Semerci (2017) argue in terms of the necessity of participation of every single citizen for the establishment and maintenance of justice in societies. In this regard, it is of utmost importance to have access channels available for the youth to contribute to public welfare.

Being part of the solution for surrounding issues in the immediate context and at the global level can be enhanced through education. Hence, not only awareness regarding SDGs but also skills required in the current era, namely 21<sup>st</sup> century skills, play a critical role in promoting civic engagement of participants in world issues. Almost all of the participants included in the study highlighted the contribution of education with a particular focus on world issues and methods to follow to find solutions. “I have not found a solution to a global problem yet, but I have used these skills in my own life, my own assignments and social environment and they have proved really beneficial”. [Participant 3] Also, concerning the skills to be utilised while offering solutions to global issues and thus becoming part of the solution has been elaborated on as stated by participant 8, “During class, our instructor frequently asks us questions that require us to think critically and we sometimes exchange information about our responses. This has taught me collaboration and enhanced my sophisticated thinking skills. My creativity skills have been boosted while brainstorming for issues discussed in class. Especially research assignments focusing on finding solutions to global issues have contributed to my skills for offering solutions”. [participant 8]

## **Conclusion**

This paper highlights the awareness and consciousness of the youth of global citizenship and their willingness for civic engagement and active participation in the solution of global societal challenges. The perceptions have been articulated with reference to practices in an undergraduate level course specifically designed to enhance students’ communication skills while raising their awareness regarding sustainable development and to help them become responsible citizens employing 21<sup>st</sup> century learning skills. This work contributes to the generation of knowledge regarding changing perceptions and level of awareness of the youth of global issues and how education can facilitate their contribution to public welfare. The results provide valuable information for policy makers as well as professionals in the field of higher education. However, this study is not without limitations. The study was conducted in a single university asking perceptions of 18 undergraduate level students. Therefore, the results cannot be considered representative of the whole population of university students.

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***The Prestigious of Nursery School Teachers in the Changes of Preschool Education  
During COVID-19 Pandemic in the Czechia and Slovakia***

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**Abstract**

The text is based on a project named Impacts of the COVID 19 pandemic on selected functions and conditions of pre-school education in the context of preparing children to start compulsory schooling in selected European countries, which is implemented at the Faculty of Education of Palacký University Olomouc in the Czech Republic. This text presents a comparative study of the Czech Republic and Slovakia focusing on the changes in the prestige of nursery school teachers during the COVID 19 pandemic from the perspective of parents and teachers. For the needs of the text, a qualitative research design was chosen using a content text analysis and a semi-structured interview with parents of preschool children. The obtained data were then subjected to open coding and subsequent categorization. The results of the comparative study show a change in the perception of nursery school teachers and their professional competencies on the part of parents, as during the pandemic there was a shift of education to the home environment both in the Czech Republic and in Slovakia. In the context of preparing children for primary school, it can be stated that this new role was even more challenging for parents, as systematic preparation required their considerable involvement and efforts with the external support of nursery school teachers. We believe the benefit of this study is the support of professional discussion on teacher prestige in general and identification of the connection between teacher prestige and the COVID 19 pandemic.

**Keywords:** Preschool Education, Nursery School Teacher, Teaching Prestige, Comparison, Covid-19 Pandemic, Comparative Pedagogy

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## 1 Introduction

Education in the Czech Republic and Slovakia was affected by the COVID 19 pandemic (referred to as the pandemic). Preschool education in both countries was suspended for a certain period of time. Nursery schools had to cope with anti-epidemic measures gradually implemented by the governments of both countries. This led to changes in the fulfilment of the functions and conditions of preschool education. In practice, these changes were reflected in the usual operation of nursery schools, organization of preschool education, everyday work of nursery school teachers and naturally, the position of the family and cooperation with the family changed. The study of resources and research (Gajdová, Srbená 2021) suggested another category that was worth investigating – transformation of the prestige of the teaching profession from the perspective of society, namely children's legal guardians (referred to as parents). During the partial closure of nursery schools, parents took over a part of the educational function of nursery schools. First, this paper presents the basic theoretical framework and then focuses on a comparative research study.

### 1.1 Preschool education in an emergency situation associated with the pandemic

For clarity purposes, the table below shows the anti-epidemic measures in both countries including a commentary.

ANTI-EPIDEMIC MEASURES	CZECH REPUBLIC	SLOVAKIA
Increased hygiene measures (disinfection, disposable wipes, soap...)	YES	YES
Distance according to applicable standard	YES	YES
Wearing masks/respirators (at least one month)	YES	YES
Mandatory testing of children for Covid-19 (at least once a week)	YES	NO
Mandatory testing of staff for Covid-19 (at least one month)	YES	YES
Change to the education programme	YES	YES
Change to the implementation of education	YES	YES
Distance education	YES	YES
Restricted contact with parents	YES	YES
School events, performances	NO	NO
Social events and trips	NO	NO
Closure of nursery schools due to the absence of children or staff	YES	YES
Closure of nursery schools by governmental regulation	YES (50 working days)	YES (55 working days)

**Table 1.** Measures to prevent the spread of Covid-19 in nursery schools in 2019/2020 and 2020/2021 in the Czech Republic and Slovakia



Comment: The measures introduced in both countries were similar with some differences in the testing of children.

All nursery schools in the Czech Republic had to follow the guidelines issued by the Ministry of Education, Youth and Sports (referred to as the MEYS). The MEYS issued anti-epidemic measures and recommendations for distance education of children in the mandatory year of preschool education (MEYS, 2020). The only nursery schools exempt from closure were those that provided care for the children of parents in professions necessary for the operation of the state. Home education was also allowed to parents who wanted to leave their children at home (MEYS, 2021c). Nursery schools were closed from 27 February 2021. Gradual reopening started on 1 April 2021 for children in the mandatory year of preschool education. The maximum number of children per class was 15. Nursery schools were open for all children without testing from 10 May 2021 (MEYS, 2021b).

According to a decree of the Ministry of Education, Science, Research and Sport of the Slovak Republic, school authorities in cooperation with nursery school directors could decide on the reopening of nursery schools and their regime. According to the Ministry, parents were supposed to bring their children to nursery schools just before the start of their working hours and collect them immediately after their end. The working hours of nursery schools were decided by their school authorities. School authorities also had to respect the Ministry's decision concerning the maximum number of children per class (15 children) (ŠPÚ, 2020; (Učíme na diaľku, 2021).

## **1.2 Prestige of nursery school teachers**

### **Czech Republic**

Prestige is rated on a scale that reflects income, responsibility and educational attainment. Experience shows that the prestige of nursery school teachers is declining (Vujičić et al., 2015). The position of teachers in preschool institutions is not a widely debated topic; emphasis is rather on secondary and elementary school teachers (Havlík, Koťa, 2011). Research shows that more than 88% of female nursery school teachers feel that their profession is undervalued by society. According to most respondents, the prestige of nursery school teachers is evaluated through two activities: play and babysitting. The main actors who determine the prestige of nursery school teachers are parents who have high expectations and demands for nursery schools. The Covid pandemic changed the life of parents and children at the time of school closure. Parents had to get involved in the work assigned to children by nursery schools. In this way, they had a closer look at the activities of nursery schools and saw that children also learned and not just played (Majerčíková, Urbaniecová, 2020).

### **Slovakia**

Social prestige is an expression of respect enjoyed by a social group or individual in society. Persons with high prestige have a strong influence, are admired and imitated (Tuček, 2011). The prestige of the teaching profession is much discussed in Slovakia, suggesting a decrease in the importance and seriousness of the profession. According to a TALIS international research study, up to 65% of Slovak teachers believe that society does not respect the teaching profession. The teaching profession in Slovakia is going through a crisis due to the feminization of the profession, ageing of teachers, low pay, lack of qualified teachers,

unattractiveness of the profession due to the low prestige and the impossibility of career growth (Búgelová, Baňasová, 2003).

### 1.3 Compulsory distance preschool education

#### Czech Republic

Since 2017, children in the Czech Republic who reach five years of age by 31 August of the respective school year are required to take free-of-charge compulsory preschool education. The scope of compulsory education is at least 4 hours per day from Monday to Friday (Act No. 561/2004 Coll.). For 50 working days, children in compulsory preschool education were taught by means of distance education. Distance education was based on the document *Recommendations for distance education in nursery schools (MEYS, 2021a)*. The Ministry also established the “Distance Education” website. The main responsibility for education was on parents who were supposed to educate their children at home according to the teacher’s instructions. The distance form of education took place by means of offline activities assigned by nursery school teachers, online via the Zoom platform or through the RVP.cz and EDU.ceskatelevize websites where parents were provided with educational ideas. Another aspect that changed in the course of distance education was educational diagnostics which focused especially on content analysis of children’s work (MEYS, 2021a).

#### Slovakia

In Slovakia, preschool education has been compulsory and free of charge since 2021 and applies to children aged five years and older (Eurydice, 2021). At the time of school closure, teachers had the opportunity to use the ucimenadialku.sk portal established by the National Institute for Education of the Slovak Republic. Teachers prepared methodological resources, worksheets, etc. They were in contact with parents and informed them on a regular basis according to the director’s instructions. The following are examples of the forms of distance education: Krátke metodické inšpirácie, Naše detičky, Hravo zdravo, Zavretá škola, Digiškola, Eurorozprávky, Delmat and others. Educational diagnostics was performed by teachers only on the basis of children’s work and consultations with parents concerning the way children performed their assignments (Učíme na diaľku, 2022).

As suggested by the theoretical part, the preparation of children for starting compulsory education was affected in both countries and partially had to take place home under parents’ supervision. This fact was taken into account in the present research and the research question and methodological procedures were formulated accordingly.

## 2 Research Design

For the purposes of the comparative research study, the qualitative research approach was chosen.

**Research problem:** Did the COVID-19 pandemic transform the prestige of nursery school teachers and the attitude of parents to children’s preparation for starting compulsory education?

**Objective:** Compare how the anti-epidemic measures in the two countries influenced preschool education with an emphasis on teachers' prestige and parents' attitude to children's preparation for starting compulsory education in the course of the pandemic.

### **Research Questions:**

The research questions are based on the research problem and goal:

RQ 1 Did the prestige of nursery school teachers change during the pandemic?

RQ 2 Did the attitude of parents to children's preparation for starting compulsory education change during the pandemic?

### **Research methods**

The following two methods were used: content text analysis and semi-structured interviews with parents of preschool children and nursery school teachers. The content text analysis was based on current and older documents provided by the state administration and government, ministries of health and education in both countries as well as applicable legal documents and articles. The semi-structured interviews were conducted with two parents of preschool children and four nursery school teachers from both countries involved in the study. Slovakia was selected for this comparative study on the basis of the following criteria: similar anti-epidemic measures, similar country size, similar curricular documents, common past of both countries. Data analysis was performed according to Gavora (2014) as follows: semantic units were determined, analytical categories were quantified, analytical categories were determined and subsequently interpreted.

Data were analysed using the open coding technique, analytical categories were formulated and the results were compared using the principles of comparative pedagogy. The basic precondition in a comparison is comparability, systematization and searching for causalities (Vlček, 2015). In the present research, the comparison included data from the documents obtained and from interviews with participants from the Czech Republic and Slovakia. The data obtained are based on a qualitative study and cannot be generalized.

### **Description of interview participants**

Semi-structured interviews were conducted with a total of 6 participants. They included two parents of preschool children and four nursery school teachers from the Czech Republic and Slovakia.

The basic criterion for the selection of parents was attendance of their child in nursery school during the pandemic, while the basic criterion for the selection of teachers was inclusion of their nursery school in the register of schools. Participants were recruited by the snowball technique.

P1: Participant 1: parent from the Czech Republic, female, 40 years, university degree, two children.

P2: Participant 2: parent from Slovakia, female, 32 years, university degree, one child.

P3: Participant 3: teacher from the Czech Republic, 53 years, secondary teacher training education, 23 years of work experience, works in a state nursery school, 3 homogeneous

classes, the school authority is the local municipal government. The nursery school has 7 teachers and is attended by approximately 70 children.

P4: Participant 4: teacher from the Czech Republic, 64 years, secondary teacher training education, 28 years of work experience, works in a state nursery school, the school authority is the local municipal government. The school has 3 age-homogeneous classes and is attended by approximately 70 children. The nursery school has 7 teachers.

P5: Participant 5: teacher from Slovakia, 32 years, university degree in preschool education, 11 years of work experience, works in a private nursery school included in the register of schools. The school has 3 age-heterogeneous classes and is attended by approximately 50 children. The nursery school has 7 teachers and one teaching assistant.

P6: Participant 6: teacher from Slovakia, 31 years, secondary teacher training education, 10 years of work experience, works in a private nursery school included in the register of schools. The school has 2 heterogeneous classes and is attended by approximately 32 children. The nursery school has 5 teachers.

## 2.1 Data analysis and interpretation

In the context of comparative pedagogy, the procedure according to Bereday was applied (Bereday, 1966, as cited in Vlček, 2015). The research problem was formulated, data were collected, findings were described and interpreted, a juxtaposition framework was developed and a comparison and search for causalities was performed. As far as the two methods are concerned, data were analysed and interpreted separately. The text below presents the juxtaposition related to RQ1 followed by RQ2.

### 2.1.1 Juxtaposition based on content text analysis concerning the prestige of nursery school teachers

SELECTED CRITERIA	CZECH REPUBLIC	SLOVAKIA
Recognition of the position as seen by teachers	88% of teachers believe that the position of nursery school teachers is underappreciated	65% of teachers think that society does not respect nursery school teachers
Degree of prestige	Nursery school teachers have a lower prestige	The teaching profession has a low prestige

**Table 2.** Juxtaposition of nursery school teachers' prestige  
(Majerčíková, Urbaniecová, 2020; Ministerstvo školstva, vedy, výskumu a športu SR, 2012)

#### Recognition of the position as seen by teachers

A similar fact was observed in both countries: nursery school teachers feel that their profession is undervalued. There is a slightly higher percentage of teachers in the Czech Republic who think that their profession is insufficiently appreciated by society. In Slovakia, there is a lower percentage of teachers who consider their work to be insufficiently respected by society and believe that teachers' importance and respect should be addressed.

## Degree of prestige

In both countries, the prestige of nursery school teachers is low. In the Czech Republic, the teaching profession is not very attractive because of low pay, especially for men. Other aspects include educational attainment because unlike other teaching professions, the minimum requirement for nursery school teachers is secondary teacher training education. In Slovakia, the teaching profession in nursery schools is going through a crisis because of low prestige. However, other factors include low pay and lack of teachers whether due to retirement or insufficient qualification. Men in Slovakia do not show interest in the profession, mainly because of feminization and inadequate pay.

### 2.1.2 Juxtaposition based on semi-structured interviews concerning the prestige of nursery school teachers

SELECTED CRITERIA	CZECH REPUBLIC	SLOVAKIA
Changes in prestige after the pandemic	No change in the long term	No change in the long term
Communication and cooperation with the family	Dependent on parents, rather good	Dependent on parents, rather poor
Benefits of distance education	Greater involvement of parents	No real benefits
Higher number of children with postponement of school attendance	Same number of postponements irrespective of Covid-19	Similar, slightly increased as a result of Covid-19

**Table 3.** Juxtaposition of nursery school teachers' prestige

### Changes in prestige after the pandemic

In both countries, teachers received thanks and recognition for their work during the pandemic. In the long term, however, the approach to nursery school teachers has not changed significantly. According to participant P3, teachers' prestige in the Czech Republic has not increased, they only received recognition for "babysitting" rather than education of children. In Slovakia, similar to the Czech Republic, teachers received thanks for their care for children. According to participant P6, although parents had the opportunity to educate their children at home, they still do not appreciate teachers' work and consider them to be babysitters. In her opinion, this situation continues to deteriorate.

### Communication and cooperation with the family

In the Czech Republic, parents' communication was mostly adequate, they replied to emails and submitted assignments. However, there were also parents whose communication was limited or completely absent and had to be reminded by teachers. In Slovakia, communication with parents also ranged from excellent cooperation to indifference or ignorance of online meetings of children with their teachers.

Parents in both countries agree that the area of communication between the family and the teacher changed. During the closure, communication was conducted especially between

teachers and parents and was paradoxically more intensive than during the normal operation of schools, which at least partially continued after schools had been reopened.

### Benefits of distance education

Teachers in neither country identified a positive aspect of distance education. In the Czech Republic, only participant (P3) thought it was a benefit that parents had a closer look at the education of their children. In this way, they could realize the necessity and difficulty of the teaching profession. Participants from Slovakia did not find any positives associated with distance education; on the contrary, because of the closure, more children face postponement of school attendance, they are unable to concentrate and have problems with speech comprehension and development of imagination.

### Higher number of children with postponement of school attendance

According to participants, the number of children in the Czech Republic with postponement of school attendance has not increased and is similar to previous years. A real effect of the pandemic on postponement of school attendance will be identified in the future due to the current absence of statistical data. The situation in Slovakia is individual. According to one participant (P5), the number of children with postponement has not increased and her school only has one case not associated with the pandemic. Another participant (P6) says that postponement of school attendance in their school is related to the pandemic and she believes that one of the reasons was that parents did not have enough time to prepare with children due to their employment. According to participant P6, the higher number of children with postponement of school attendance made parents realize the importance of nursery school but not the importance of teachers themselves.

#### 2.1.3 Juxtaposition based on content text analysis concerning the preparation of children for enrolment in primary school during school closure

SELECTED CRITERIA	CZECH REPUBLIC	SLOVAKIA
Compulsory preschool education	For children who reach 5 years of age (since 2017)	For children who reach 5 years of age (since 2021)
Communication	Mostly online with parents	Mostly online with parents
Assessment of educational results	Based on assignments	Completed work, consultations with parents
Sources of distance education	Assignments, websites, worksheets	Assignments, websites, worksheets

**Table 4.** Juxtaposition of distance education and preparation of children by parents for enrolment in primary school

### Compulsory preschool education

In both countries, compulsory preschool education applies to children who reach five years of age as of 31 August of the respective year. In the Czech Republic, this obligation was enacted in 2017, while in Slovakia, compulsory preschool education was enacted after the first Covid wave in 2021. In both cases, distance education became mandatory for children with compulsory preschool education.

## Communication

Due to the closure of nursery schools in both countries, communication between teachers and parents was conducted exclusively online or when children's assignments were submitted. Direct contact between teachers and children was not allowed and only took place if nursery schools introduced online meetings with children through various applications. Direct contact between children was not allowed either.

## Assessment of educational results

Due to the lack of contact between children and teachers, education in the Czech Republic and Slovakia was the primary responsibility of parents. Teachers gave assignments and recommended websites where parents could take inspiration. Educational diagnostics was performed by teachers exclusively on the basis of assignments and their analysis.

## Sources of distance education

Education in both countries was performed especially through assignments based on worksheets, videos or written instructions. During the pandemic, countless websites emerged with suggestions for teachers, parents and children.

### 2.1.4 Juxtaposition based on semi-structured interviews concerning the preparation of children for enrolment in primary school during school closure

SELECTED CRITERIA	CZECH REPUBLIC	SLOVAKIA
Home education	Completion of assignments, parents' activity, educational videos	Completion of assignments, parents' activity, online education via Zoom
Cooperation between parents and teachers	Dependent on parents' attitudes	Dependent on parents' attitudes
Deterioration of children's development	Social area, communication	Social area, communication
Distance education leads to a higher level of school readiness	Definitely not	No

**Table 5.** Juxtaposition of distance education and preparation of children by parents for enrolment in primary school

## Home education

Due to the closure of nursery schools in both countries, children were taught by means of distance education, where the responsibility was mainly on parents. In the Czech Republic, mother P1 admits greater care for her child compared with normal school operation. She also says that parents did not know how to work with children and it was difficult for them to understand the activities they needed to perform. Mother P2 from Slovakia who is at the same time a nursery school teacher knew how to ensure education of her child during school closure. Parents from both countries helped children perform their assignments and searched for inspiration.

## Cooperation between parents and teachers

In the Czech Republic and Slovakia, participants agreed that cooperation with parents differed depending on parents' approaches. According to participant P3 in the Czech Republic, there are parents who support their child even outside the pandemic period. In Slovakia, opinions differed. Participant P5 says that their nursery school has long-term cooperation with parents and therefore, communication and completion of assignments was not problematic. According to participant P6, parents were insufficiently involved, often failed to complete assignments and after return to nursery school, their children had problems with communication and attention.

## Deterioration of children's development

In both countries, the interviews suggest that children are most threatened in the social area and in the development of communication as they were isolated from friends and spent most of their time with their family. Families were unable to fully compensate for the frequency and variety of social contacts, which could have affected their re-socialization and future enrolment in primary school. One of the interviews suggested that children had spent more time watching TV and playing digital games, which may have negatively affected the development of children's communication and speech.

## Distance education leads to a higher level of school readiness

The interviews in both countries suggested the same result. Teachers do not think that distance education would increase the degree of school readiness. On the contrary, they believe that children are at risk as a result of distance education and generally the pandemic as they did not have access to high-quality education and high-quality preparation in nursery school.

## 2.2 Analytical categories

CATEGORIES	Restrictions caused by measures	Home preparation with the child	Changes to communication and cooperation	Limitation of the educational environment	Increased prestige of teachers during the pandemic
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**Table 6.** Analytical categories based on the interviews

*Note:* The juxtapositions mentioned above and the comparisons were used to define the categories that answer the research questions.

### Restrictions caused by measures

Nursery schools in both Slovakia and the Czech Republic recommended outdoor education, social events were not allowed, children from different classes could not meet, sports and music activities were limited. At the time of closure of preschool institutions, parents had to spend more time with their children at home and teachers had to adapt to the current conditions in nursery schools. Children were given assignments from their teachers, completed them and brought them to school or sent them online. Children in Slovakia also attended online meetings via Zoom. In the Czech Republic, teachers shared ideas for activities and made videos. The pandemic also caused some restrictions on the part of



families; parents had their work responsibilities and at the same time, especially during school closure, were responsible for the education of their children.

### **Home preparation with the child**

Due to the measures in the Czech Republic, participant P1 spent more time with her child on home preparation, which turned out to be an additional burden for the family. On the contrary, Slovak participant P2 spent the same amount of time with her child during the pandemic as before. Both participants used the resources provided by nursery schools but supported the preparation of their children for enrolment in primary school by adding their own resources, for example from the internet or books.

### **Changes to communication and cooperation**

After the closure of nursery schools, the only personal contact was between parents and teachers when parents submitted their children's assignments. Electronic communication between the school and the family intensified. Communication with parents depended on the approach of each family. In many cases, it was more frequent than under normal school operation, which partially persisted after school reopening.

### **Limitation of the educational environment**

Both children and teachers were dependent on cooperation with parents. Participants (parents) from both countries agreed that distance education was sufficient to avoid postponement of school attendance. Participants (teachers) in the Czech Republic also agreed that distance education did not have an effect on postponement of school attendance. However, participant P6 from Slovakia believes that the higher number of children with postponement of school attendance was caused by the pandemic. In the case of parent P1, the contact between the child and nursery school was restricted deliberately by the mother in order to avoid mandatory testing. During the pandemic, social and sports events were not allowed.

### **Increased prestige of teachers during the pandemic**

It can be stated that there was only a short-term increase in prestige during the pandemic. All participants agreed that they had received thanks and recognition for their work but primarily for the difficult nature of "babysitting". According to participants-teachers, after reopening of schools, parents appreciated the possibility to place their children in nursery school again but their opinions about the teaching profession did not change much. Participant P6 even says that the situation is even worse after the pandemic because teachers are considered mere babysitters and their work is not appreciated.

## **3 Conclusion**

The text presents a part of a broader research study that analyses and compares the impacts of the measures against the spread of Covid-19 on preschool education in selected European countries. The research study shows that both countries responded to the anti-epidemic measures in nursery schools in a similar way; they were able to adapt quickly and prepare for distance education during the pandemic. Nursery schools were closed for a fixed period of time due to the state of emergency both in the Czech Republic and Slovakia. Due to the

compulsory nature of preschool education, it was necessary to implement distance education. Parents took care of their children at home and during the period of school closure were primarily responsible for the preparation of their children for enrolment in primary school. Parents had a closer look at the system of education in nursery schools; this gave them an opportunity to change their opinions about teachers' prestige, which according to teachers very low. Following the objective of the research study, it appears that teachers' prestige both in the Czech Republic and Slovakia increased in the short term during the pandemic. However, when things came back to normal, no changes remained. Parents in both countries appreciated the care provided by teachers on a daily basis but not their qualified work. Research question R1 focused on the preparation of children for enrolment in primary school by parents in the home environment during school closure. The research shows that parents completed assignments given by nursery school teachers according to their individual possibilities. According to the interviews, teachers in the Czech Republic do not associate the increase in the number of children with postponement of school attendance with the pandemic, while in Slovakia they do. The reason for postponement may also be caused by parents' benevolent approaches and the higher amount of time spent watching TV or playing digital games during the pandemic.

The anti-epidemic measures in both countries restricted the operation of nursery schools and disrupted the process of education, development of preschool children, educational diagnostics and socialization as well as forced parents to take on the role of nursery school teachers in the home environment.

**The study also identified new challenges for future research in the area of preschool education in both countries:**

- New experiences of parents with preschool education and the transformation of teachers' and parents' roles;
- Supporting new perspectives of preschool education as an indispensable part of the education system;
- Supporting new perspectives of nursery school teachers;
- Highlighting the need for systematic development of preschool children and educational diagnostics in the context of preparation for enrolment in primary school.

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***Establishing Psychometric Properties of the MSU-TCTO Senior High School Entrance Examination Using Classical Test Theory and Item Response Theory***

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**Abstract**

Achievement Testing is widely used in assessing the psychological capabilities of a person. Thus, correct test constructs are important in achieving the purpose of testing. The Mindanao State University-Tawi-Tawi College of Technology and Oceanography Senior High School Entrance Exam (SHSEE) is the first MSU-TCTO school-made paper-and-pen achievement test that was conducted on November 18, 2018, to 1,260 students in different schools in Tawi-Tawi and is given annually to prospect senior high school students. It is composed of 75 English, 40 Mathematics, 30 Science, and 25 Aptitude multiple-choice questions. This study aimed to establish the psychometric properties and the level of adequacy of the examination using the Classical Test Theory (CTT) and Item Response Theory (IRT) models, and any significant difference thereof. The study employed a descriptive quantitative design and used the raw data from the research instrument, which is the scored answer sheet of the 200 examinees. Stratified sampling was applied. Statistical Program for Social Sciences (SPSS) was used to determine the reliability indices according to CTT and IRT. The study concluded that the test items of SHSEE were highly adequate and reliable on both CTT and IRT. Furthermore, there is a significant difference between the reliability index under IRT and CTT models at 0.05 level of significance, but not at 0.01, which gave slight inconsistency in the result. The study recommends to the test committee to further enhance the examination and use Item Response Theory as its statistical treatment.

**Keywords:** Achievement Testing, Psychometrics, Item Response Theory, Classical Test Theory, Difficulty Index

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## Introduction

In education, certain measurement tools such as achievement tests are used in order to assess if the students have mastered the course content. And based on these test scores, a student's journey will be affected. Thereby, correct test constructs are important for any examination to serve its purpose such as testing the psychological capabilities of a person. The problem of improving and quantifying the psychological measurement is addressed by doing a psychological testing.

The Mindanao State University-Tawi-Tawi College of Technology and Oceanography Senior High School Entrance Exam (MSU-TCTO SHSEE) is the first MSU-TCTO school-made paper-and-pen achievement test that was conducted on November 18, 2018, to 1260 students in different schools in the municipalities of the Province of Tawi-Tawi in the Philippines. The test was designed specifically to assess the junior high school students in Tawi-Tawi who aim to enroll in the MSU-TCTO Senior High School.

The questionnaire is composed of seventy-five (75) multiple-choice questions (MCQ) for English, forty (40) MCQs for Mathematics, thirty (30) MCQs for Science, and twenty-five (25) MCQs for the aptitude. The examination is set to assess the mental and psychological capabilities of all students before they are given admission to the senior high school program of the university. And, it is expected to be conducted every year.

This study aimed to establish the psychometric properties of the Mindanao State University-Tawi-Tawi College of Technology and Oceanography Senior High School Entrance Exam (MSU-TCTO SHSEE) for a deeper analysis and possibly improvement of the Standardized Entrance Exam.

It specifically tried to answer the following questions:

- 1.) What is the level of reliability or adequacy of the test item of the Mindanao State University-Tawi-Tawi College of Technology and Oceanography Senior High School Entrance Exam using the Item Response Theory (IRT)?
- 2.) What is the level of reliability or adequacy of the test item of the Mindanao State University-Tawi-Tawi College of Technology and Oceanography Senior High School Entrance Exam using Class Test Theory (CTT)?
- 3.) Is there a significant difference of the reliability or adequacy of each item of the Mindanao State University-Tawi-Tawi College of Technology and Oceanography Senior High School Entrance Exam using Item Response Theory and Classical Test Theory?

The results of this study will help in the further improvement of the standardized examinations that will be given by the university to its prospect students, which will guarantee better evaluation and assessment of the test-takers.

### 1.1 Psychological Testing

Psychological testing has to do with procedures for selecting, administering and interpreting test scores in an applied setting (Maloney & Ward, 1976). Test fairness is indeed a very

crucial social issue. Thus, the psychometric properties of tests which encompasses information regarding the test score biases must always be an aspect that notifies the use of tests in actual situations.

There are various types of psychological testing like intelligence tests (i.e. Stanford-Binet Intelligence Test and Wechsler Intelligence Scales), academic achievement tests (i.e. Scholastic Achievement Tests or SAT and Graduate Record Examination or GRE), structured personality tests (i.e. California Psychological Inventory or CPI and NEO Personality Inventory), and career interest/guidance instruments (i.e. Strong Inventories and Self-Directed Search).

Essay, multiple choice, and performance items are some of the cognitive test item types that are used in academic achievement tests. These are often widely classified into objective items and performance assessments. The former are more structured and mostly have only one correct answer. They are divided into two categories: selection-or-recognition-types of items such as multiple-choice, true or false, and matching-type tests, and supply-types items such as sentence completion and short-answer tests.

According to Bandalos (2018), the most versatile of all item test types are the multiple-choice items. It is often concluded that multiple-choice items can only measure information recall and memory sharpness. However, when this type of test is carefully thought and constructed, it is capable of tapping into a much higher level cognitive process like analysis and information synthesis. Test items that require comparison, interpretation of tables and graphs, or creation of new context are examples of item types that require high cognitive reasoning and processes.

Multiple-choice items can also be used to gather diagnostic information regarding a taker's misunderstandings, in addition to cognitive processes (Bandalos, 2018).

## 1.2 Psychometrics

Psychometrics is the quantitative and technical aspect of measuring mental capabilities. The Psychometric Society was founded in 1935 and it sponsored the journal *Psychometrika* with its first volume appearing in March 1936. This led to a plea to recognize “a mathematical underpinning for psychological research.” Psychometricians, those who are specialists in Psychometrics, are especially keen in providing methods and processes for statistical measurements that can be used widely in psychological research.

According to Appelbaum (1986), the longest-running topic in *Psychometrika* was perhaps involving computation of the tetrachoric correlation that forms the basis of many approaches in item analysis in test theory.

The study directed on school children by Alfred Binet was the first breakthrough in the study of intelligence. He, then, came up with the Binet scales. This scales and their descendants, together with the IQ concept that is associated with them, continue to be used until today.

Furthermore, David Wechsler and associates extended the intelligence testing to adults and the changed the IQ concept from the mental age system (Mental Age/Chronological Age x 100) to the notion of a deviation IQ that is based on established standards. He was primarily concerned with assessing intelligence of individuals rather than groups. Moreover, as the 20<sup>th</sup>

Century came, many group-administered paper-and-pencil tests also appeared. These are old Army Alpha and Beta tests, which were created for the screening of inductees in the armed forces during World War I (Goldstein and Hersen, 2000).

In educational, industrial, military, and clinical settings, the psychological or intelligence test became a widely-used assessment instrument. Some tests emphasized gaining an IQ quotient. However, others use them as way to evaluate and measure cognitive processes. (Goldstein and Hersen, 2000).

### 1.3 Classical Test Theory (CTT)

The Classical Test Theory or CTT is said to be the forerunner in the use of statistics in measuring test scores. It was then called the True Score Theory. It was only distinguished as “classical” eighteen years later in *Statistical Theories of Mental Test Scores*, a book authored by Frederic M. Lord and Melvin Robert Novick and was originally published in 1968.

The CTT has dominated the methods used in the application of test theories to assessments. Charles Spearman figured out how to correct a correlation coefficient due to measurement error and how to solve the reliability index needed in making such correction in 1904. This became the Spearman’s model, which was expressed in the following form:

$$X = T + E \quad (1)$$

Where:  $X$  = the observed test score, denoted by  $\rho_{XT}^2$ ;

$T$  = the individual’s true score, denoted by  $\sigma_T^2$ ;

$E$  = a random error component, denoted by  $\sigma_X^2$ .

Therefore:

$$\rho_{XT}^2 = \frac{\sigma_T^2}{\sigma_X^2}$$

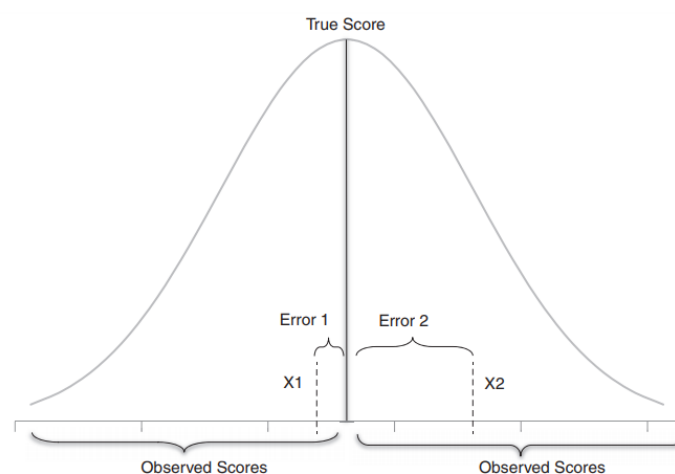


Figure 1. The distribution of observed scores around the true score



Figure 1 shows us the distribution of observed scores around the true score. Moreover, the error scores are seen as being random. If these error scores were not indeed random, they will have to cancel each other if repeated testing was done. Moreover, the average of these repeated scores would not be equal to the true score. In CTT, the error scores are treated as random and this will result in a normal distribution of observed scores around the true scores (Bandalos, D. L., 2018).

Statistical indices based on CTT has a weak assumption and easier to compute, manipulate and understand; thereby, it is easy to use (Hambleton and Jones, 1933).

### 1.3.1 CTT Difficulty and Discrimination Indices

Osarumwense & Oyediji (2015) calculated the item Difficulty Index of an entire number of examinees using the formula:

$$P = R/T \quad (2)$$

Where:  $P$  = item difficulty index,

$R$  = the number of correct responses; and

$T$  = the total number of responses (i.e., correct + incorrect + blank responses)

The computation for the Difficulty Index uses the percentage sample. The scripts were arranged in descending order of the performance of the examinees and the first 27% of the scripts called the upper group U and the last 27% of the scripts called the lower group L were taken the formula:

$$P = \frac{R_U + R_L}{N_U + N_L} \quad (3)$$

Where:  $P$  = Item difficulty index

$R_U$  = the number of examinees who got the item correctly in the upper group,

$R_L$  = the number of examinees in the lower group who got the item correctly,

$N_U$  = Number of examinees of the upper group; and

$N_L$  = number of examinees of the lower group.

For better understanding on the values of the item difficulty index of CTT, the intervals with the corresponding interpretation on Table 1.3.1.1 will be used.

Range	Difficulty Level
0.20 and below	Very difficult
0.21 - 0.40	Difficult
0.41 - 0.60	Average
0.61 - 0.80	Easy
0.81 and above	Very Easy

Table 1.3.1.1. Interpretation of the Difficulty Index ( $P$ )

The Discrimination Index, on the other hand, is computed using the difference between the percentage of students in the upper group ( $P_U$ ), i.e., the top 27% scorers, who obtained the correct response, and the percentage of those in the lower group ( $P_L$ ), i.e., the bottom 27% scorers, who obtained the correct response; thus,

$$D = P_U - P_L \quad (4)$$

Where:  $D$  = discrimination index

$P_U$  = upper group

$P_L$  = lower group

For better understanding on the values of the item discrimination index of CTT, the intervals with the corresponding interpretation on Table 1.3.1.2 will be used.

Range	Discrimination index
0.40 and above	Very good
0.30 - 0.39	Good item
0.20 - 0.29	Fair item
0.09 - 0.19	Poor item

Table 1.3.1.2. Interpretation of the Discrimination Index ( $D$ )

Classical Test Theory approaches are still used today, however, there is also a modern test theory which is known as the Item Response Theory (IRT). CTT has clear shortcomings, thus the reason that modern test theory emerged. IRT was developed to address such issues brought about by CTT.

#### 1.4 Item Response Theory (IRT)

Item Response Theory or IRT is another statistical tool which analyzes the test scores of respondents to each several items or trials are mutually-exclusive categories. IRT is also known as latent trait theory, strong true score theory, or modern mental test theory. It can be applied to a broader and wider scope. In fact, it was developed for purposes of educational assessment and measurement, specifically on student achievement.

IRT has improved immensely the measurement of achievement testing as it overcomes the limitations that was set by CTT. It assumes a continuous latent variable, thus the term 'latent trait theory,' that represents the student's proficiency in responding to test items. The probability of a response in any of two-or-more mutually exclusive categories of an item is assumed to be a function of the location of the student on the latent continuum and of certain estimable parameter characteristic of the item. This process directs to the statistical procedures of test scoring on any number of items without the assumption that these test items are sample from a defined item to which the result generalize (R. Darell Bock and Irini Moustaki, 2007).

In addition, Lee and Cho (2013) stated many e-learning and assessment systems based on IRT are mainly concerned with the ability estimation in order to suggest adjusting learning content or change the test difficulty level in a more customized learning setup. Chang and Yang (2009) also stated that other applications firstly applied IRT for capability estimation and further used classification methods for student rank.

According to Lazarsfeld (1958), item responses being statistically independent, given the respondent's location in latent space, is a further critical assumption in IRT. He made use of the principle of "conditional" independence as an analysis table data.

### 1.4.1 General IRT Framework

R. Darell Bock and Irini Moustaki (2007) said that the dichotomous, ordered polytomous, nominal polytomous, and ranking are commonly employed modes of response modelled in item response theory.

According to Zheng (2014) multiple choice questions that have dichotomous items, the most common IRT models are the one-parameter logistic (1-PL) model, two-parameter logistic (2-PL) model, and the three-parameter logistic (3-PL) model. The probability of a correct response to item  $j$  from an examinee with ability level  $\theta$  is modeled by the following item response functions (IRFs):

$$1-PL; \quad P_j(\theta) = \frac{1}{1 + \exp[-(\theta - b_j)]}; \quad (5)$$

$$2-PL; \quad P_j(\theta) = \frac{1}{1 + \exp[-a_j(\theta - b_j)]}; \quad (6)$$

$$3-PL \quad P_j(\theta) = c_j + \frac{1 - c_j}{1 + \exp[-a_j(\theta - b_j)]}. \quad (7)$$

Where:

$a_j$  = parameter of discrimination of item  $j$ , with  $a \in (0, \infty)$ ,

$b_j$  = parameter of difficulty of item  $j$ , with  $b \in (-\infty, \infty)$ ,

$c_j$  = parameter of pseudo-guessing of item  $j$ , with  $c \in [0, 1]$ , and,

$\theta$  = level of ability of the examinee, with  $\theta \in (-\infty, \infty)$ .

Most application of Item Response Theory estimates student's ability basing on two-parameter model (Rasch, G., 1960).

When using IRT method in estimating the ability of a student, Binh and Dui (2016) stated that it depends not only on the number of correct answers but also each item attributes. If two students correctly answer the same item, they must receive the same result. On the other hand, if two students correctly answered the same number of questions but different test items, the result can differ. This makes the two estimation models, CTT and IRT, different from each other. In fact, they can be called linear and nonlinear model, respectively. The one-parameter model sets default for all items with the same difficulty, which is 1. Taking all of those into consideration, these encourage us to use the two-parameters instead of one-parameter.

In estimating ability, according to Baker (2001), there are three methods. These are ability estimation with clear question parameters, question parameters estimation with clear student's ability, and ability and question parameters estimation.

Ability estimation with clear question parameters is the easiest way. The initialized values of an ability will be the beginning of the ability estimation process. The value is, then, employed to calculate the probability of questions with right or correct answers. This value can also be changed further in order to improve the calculated probability value to fit the answered questions result. This process of changing the value will continue until the adjustment value is smaller than threshold value and the estimated ability is not considerably changed. Such process will be done for all the students participating in the test.

## 1.5 Methods

This study used the descriptive quantitative design, which is a research design that involves observing and describing the behavior of a data (quantitative data) without influencing it in any way. The data used in this study are the raw data from the scored answer sheets of the MSU-TCTO SHSEE given in November 2018, which also served as the research instruments, in analyzing and describing their respective psychometric properties. They were gathered from the Admission Office of MSU TCTO. Stratified sampling was applied in order for the study to avoid biases. The researcher grouped the respondents into different strata according to the municipality in order to have proper distributions of the test takers. Then, the researcher picked in random the envelope of the result from the different municipalities until the desired number of respondents was acquired.

The researcher tallied each correct and wrong answer per test item using the Microsoft Office program, specifically MS Excel, 1 for correct answers and 0 for wrong answers respectively. The name and total scores of the students were represented by numerical values. The study used the formula for the Classical Test Theory (CTT) and Item Response Theory (IRT), specifically the 1PL and 2PL model using the Statistical Program for Social Sciences (SPSS), to determine the difficulty and discrimination index of the said exam. The *t*-Test had been used to determine the significant difference between CTT and IRT. A statistician was consulted for the proper use of the program.

## 1.6 Results

The following are the results generated using the Statistical Program for Social Sciences (SPSS).

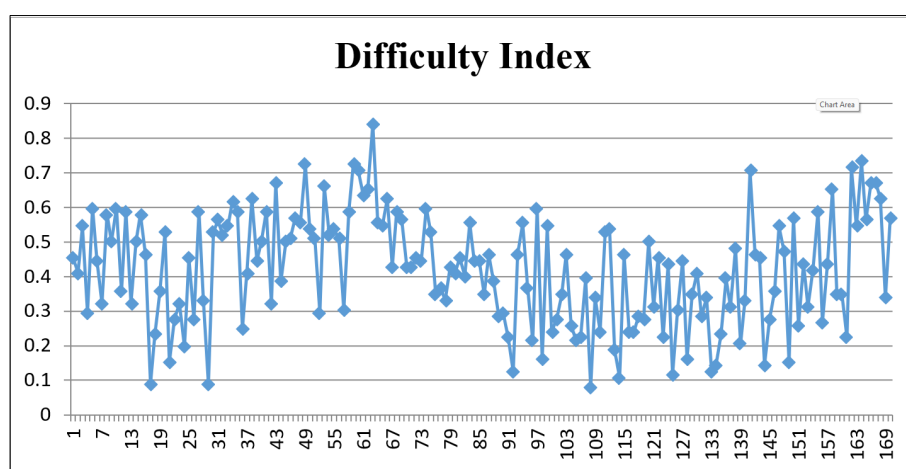


Figure 2: Difficulty Index of the SHSEE using CTT

Results showed that most of the items have difficulty values less than 0.5, which implies that these items are difficult for the takers of MSU-TCTO SHSEE in November 2018. Three of the items that were very difficult are item numbers 17, 29, and 108. On the other hand, only one item is considered to be very easy, which is item number 63. It also showed that most of the items in mathematics and science were very difficult for the test takers while most items in language were moderately easy for them.

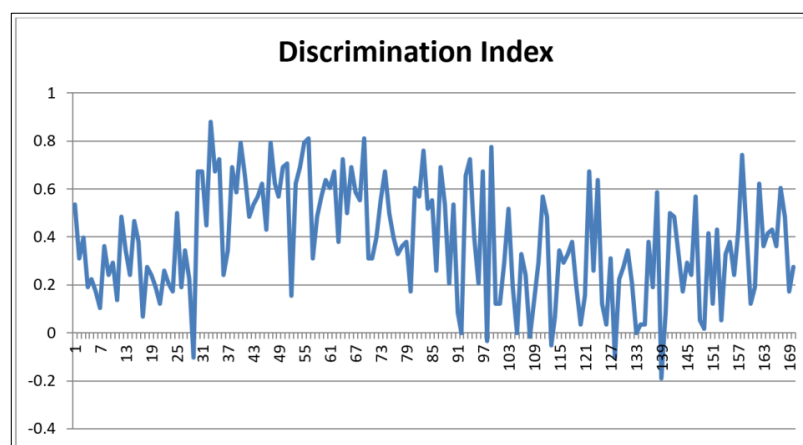


Figure 3: Discrimination Index of the SHSEE using CTT

Using the Classical Test Theory, results showed that there were few items that were below zero discrimination values. This means that these items were poor items and should be subject to removal or revision. Further, most of the items have discrimination values higher than 0.2 which can be considered good items.

Subject	Reliability	Interpretation
Aptitude	0.714	Reliable
Language	0.925	Highly Reliable
Math	0.739	Reliable
Science	0.691	Reliable

Table 2: The Reliability Test for Classical Test Theory by Subject

Moreover, the test in Aptitude, Mathematics, and Science under Classical Test Theory has reliability indices of 0.714, 0.739, and 0.691 respectively which are interpreted as reliable. While the test in Language with a reliability index of 0.925 is interpreted as highly reliable.

Subject	Reliability	Interpretation
Aptitude	0.974	Highly Reliable
Language	0.965	Highly Reliable
Math	0.967	Highly Reliable
Science	0.983	Highly Reliable

Table 3: The Reliability Test for Item Response Theory

Under the Item Response Theory, the Aptitude category got reliability of 0.974 meaning it is highly reliable. Language has a reliability score of 0.965 the interpretation it is also highly reliable. Math and Science got a reliability score of 0.967 and 0.983 respectively meaning they're also highly reliable. The tendency for IRT to have higher reliability is due to the approximation of the true variance since the data collected is on part of the population.

Test Theory	Overall Reliability	Interpretation
Classical Test Theory	0.939	Highly Reliable
Item Response Theory	0.968	Highly Reliable

Table 4: Overall Reliability of the Item under CTT and IRT

<i>t</i> -value	<i>p</i> -value	Interpretation
-3.679	0.035	No significant difference

Table 5: Comparison between IRT and CTT for Reliability

Both CTT and IRT were highly reliable with a reliability index of 0.939 and 0.968. By comparison, the IRT had a slightly higher reliability index than the CTT. The difference might be due to the definition of the true variance in IRT that the distribution was normally distributed with mean zero and variance one. The *t*-value was -3.679 with a *p*-value of 0.035 which is less than the level of significance of 0.05, this means that there is a significant difference between the IRT model and the CTT approach. However, is not significant at a 0.01 level of significance. The result implies that the difference was about 95% level of confidence only.

The following are the findings of the study:

- 1.) the result of the SHSEE under CTT for Language is highly reliable, meaning highly adequate and acceptable;
- 2.) the results of the SHSEE under CTT for Aptitude, Mathematics and Science are reliable, meaning adequate and acceptable;
- 3.) the overall result of the SHSEE under CTT is highly reliable, meaning highly adequate and acceptable;
- 4.) the results of the SHSEE under IRT for Aptitude, Language, Mathematics, and Science are highly reliable, meaning highly adequate and acceptable;
- 5.) the overall result of the SHSEE under IRT is highly reliable, meaning highly adequate and acceptable; and,
- 6.) the results showed that the examination both have high reliability, meaning high adequacy, under both of the Classical Test Theory and Item Response Theory.

## Conclusion

Based on the results and findings, the following conclusions are obtained in this study. The test items of the Mindanao State University-Tawi-Tawi College of Technology and Oceanography Senior High School Entrance Examination were highly adequate and reliable both CTT and IRT. Furthermore, there is a significant difference between the reliability index under IRT and CTT models at 0.05 level of significance, but not at 0.01 level of significance. Therefore, there is slight inconsistency of the result. Some of the items need to be revised in order to come up with reasonable passers for SHSEE.

This informs that the MSU-TCTO Senior High Administration and SHSEE Steering Committee shall continue to enhance the entrance examination for the next batches, the MSU TCTO SHSEE committee may use Item Response Theory rather than Classical Test Theory as statistical treatment since it gives more emphasis on each item in the assessment of the reliability of the questions in the examination.

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***Instructor Exchange as a Continuous Professional Development Activity:  
Are we Ready to Change?***

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**Abstract**

Continuous Professional Development (CPD) has been conducted through different activities for more than three decades in the field of education. However, due to various reasons, institutions have encountered major issues in the application processes of commonly accepted CPD activities, leading to modification of existing and creation of new forms of activities in line with contextual requirements and needs. With this in mind, this study aimed to explore the process and outcomes of a new form of CPD activity, namely instructor exchange, specifically developed for a School of Foreign Languages in one of the top-tier state universities in Türkiye employing a qualitative case study methodology. Analyse-apply-evaluate cycle was followed in the study considering contextual factors of the institution including but not limited to the requirements of international accreditation. Data was collected from 22 English instructors through classroom exchanges, semi-structured interviews and document analysis, followed by creation of themes according to participants' responses. For the development of the form used in semi-structured interviews, a comprehensive literature review was conducted and expert opinion and advice were obtained. Following the exchange activity, interviews were conducted by 10 of the whole population of participating instructors. The results indicated that the instructor exchange activity helped instructors to improve themselves professionally despite some challenges and it is possible to implement this activity as a school-wide practice. The emerging themes may be used to bring a new dimension to design future CPD activities based on instructors' suggestions.

**Keywords:** Continuous Professional Development, Teacher Exchange, Instructor Exchange, Accreditation, English Language Education

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## Introduction

Professional development has been an indispensable component of educational programs for long years and it has attached extra attention in accordance with the increase in awareness towards quality assurance in higher education institutions across the world. Borg (2018) defines professional development as “a key strategy for teacher improvement and ... any activity which is designed to bring about positive change in practising teachers’ competence.” (p.195). Although most of the literature focuses on pre-service teacher education and equipping the prospective teachers with necessary knowledge and skills, there has been a shift in the value attached to in-service trainings and professional development activities to be offered to teachers by their workplaces. As teaching is a field continuously expanding in accordance with societal and technological progress, there is a need for professionals to constantly improve their practices in the context of teaching. In this respect, Continuous Professional Development (CPD) was described as “a learning process resulting from meaningful interaction with the context (both in time and space) and eventually leading to changes in teachers’ professional practice (actions) and in their thinking about that practice.” (Kelchtermans, 2004, p. 220). Educational institutions thus pursue new ways to arrange a variety of CPD activities not only to cater for their teachers’ needs but also to contribute to their professional practice and expertise.

Despite the awareness of and will for offering a variety of activities for continuous professional development, institutions have encountered difficulties during the implementation of commonly accepted forms, which led to various descriptions of an effective CPD activity. Within this scope, according to Borg (2015) and Villegas-Reimers (2003), an effective continuous professional development activity a) is based on a constructivist approach, b) is a long-term process, c) is related to teachers’ needs, d) is related to school reform e) includes teachers in decision making procedures, f) encourages teachers to work in co-operation, and g) involves reflective designs in which teachers can reflect their perceptions on the activities. Findings from various studies in the literature indicate that teachers prefer informal ways of exchanging ideas with colleagues by collaborating with them (Ekşi, 2010; Yaşar, 2019; Zerey, 2018), which demonstrates the need of collegiality in the design of professional development activities. With the help of collegiality, individualism” and “isolation can be prevented (Arnold, 2002; Shah, 2012) and thus, collaboration improves quality of teaching, students’ performance and educational processes. It is a fact that formative feedback provided in a supportive collegial environment is the most influential way to improve teachers professionally (Coe et al., 2020). Therefore, it is of utmost importance to take all the factors into consideration while designing professional development activities so that they contribute to improvement of student learning and teaching quality.

Reference to quality in the context of education evokes the mechanisms of quality assurance, the most prevalent form of which in education is accreditation. In the context of higher education, Eaton characterizes accreditation as the principal mechanism employed by universities to prove and improve their processes and practices (2021), which can be accomplished “through constant assessment” (as cited in Aslan, 2009, p. 291). Accreditation is accepted as an important status granted to the higher education institutions to maintain the achievement standards in long-term (Yüksel, 2013). While accreditation may take different forms, the focus of this paper will revolve around programmatic accreditation in higher education institutions. Programmatic accreditation schemes in higher education include a number of standards related to constituents of a quality program such as curriculum, mission,

faculty, facilities, equipment, recruiting processes, program development, student services, etc. and professional development indicating that accreditation status is possible only if relevant compliance criteria are met. Therefore, continuous professional development is conducted as part of programs' accreditation arrangements, which is considered an essential constituent of academic development (Gosling, 2009). This leads programs considering or being subject to accreditation process to make necessary arrangements and improvements to meet quality criteria with regard to professional development of academic and administrative personnel as well as administrators. In this framework, Staub (2019) mentions establishment of a continuing professional development unit in their program in the scope of initial accreditation as a step towards meeting the accreditation criteria. This is only an example demonstrating the role and importance of continuous professional development in quality assurance, specifically accreditation.

Although there is still debate going on regarding whether accreditation is an effective tool in maintaining quality, to be recognized at an acceptable level worldwide in accordance with globalization and requirements of the current era, many programs including but not limited to engineering education, teacher education and intensive English education within higher education settings are in pursuit of accreditation across the world including Türkiye. There are prevalent accrediting agencies for intensive English program education, all of which include instructor professional development, which may take different forms as part of quality criteria. Therefore, accredited intensive English programs create policies and adopt strategies to contribute to their instructors' professional development, which will also serve for compliance with and maintenance of accredited status. Based on features of effective continuous professional development (Borg 2015; Villegas-Reimers, 2003) and taking into consideration the quality criteria of accrediting agencies, this study aims to explore instructors' perceptions regarding the adaptation process of a new form of CPD activity, namely instructor exchange, as implemented in the School of Foreign Languages of a large state university in Türkiye accredited by an international non-profit specialized accredited body seeking responses to the following research questions: (i) *What are the instructors' perceptions about benefits and drawbacks of the instructor exchange activity?* (ii) *What are the instructors' attitudes towards the implementation of the instructor exchange activity as a school-wide practice?*

## **Methodology**

### ***Research Setting***

The research was conducted at one of the top state universities of Türkiye. As it is a large university and the students attend the intensive English program to meet eligibility criteria for language proficiency, there are approximately 200 instructors employed under the umbrella of the School of Foreign Languages. The School of Foreign Languages is accredited by an international specialized accrediting agency and it was granted 10-year re-accreditation just a few years ago. In accordance with the number of instructors serving for the program and requirements of the accrediting agency, all CPD activities are designed in an analyse-apply-evaluate cycle. Needs analysis is conducted at the beginning of each academic year to determine professional development needs of the instructors and there is a sound evaluation system as part of School practices.

## ***Participants***

22 English instructors from the School of Foreign Languages participated in the research. The instructors were reached through e-mail and the ones that volunteered were involved in the study. Institutional Review Board approval was obtained before the initiation of the study and informed consent was received from each participant. Demographic information of the participants is illustrated in Table 1 below:

	Age	Experience	Degree	Gender
<b>Participant 1</b>	32	7 years	MA	Female
<b>Participant 2</b>	41	19 years	MA	Female
<b>Participant 3</b>	39	17 years	BA	Female
<b>Participant 4</b>	40	16 years	BA	Female
<b>Participant 5</b>	42	18 years	MA	Female
<b>Participant 6</b>	34	12 years	MA	Female
<b>Participant 7</b>	33	12 years	MA	Female
<b>Participant 8</b>	34	12 years	MA	Female
<b>Participant 9</b>	32	8 years	BA	Male
<b>Participant 10</b>	30	8 years	MA	Female
<b>Participant 11</b>	36	8 years	MA	Female
<b>Participant 12</b>	29	6.5 years	MA	Female
<b>Participant 13</b>	45	25 years	MA	Female
<b>Participant 14</b>	32	10 years	MA	Female
<b>Participant 15</b>	28	6 years	MA	Female
<b>Participant 16</b>	40	19 years	PhD in progress	Female
<b>Participant 17</b>	50	30 years	BA	Female
<b>Participant 18</b>	31	6 years	MA	Female
<b>Participant 19</b>	39	15 years	BA	Female
<b>Participant 20</b>	36	11 years	PhD in progress	Female
<b>Participant 21</b>	36	13 years	PhD in progress	Female
<b>Participant 22</b>	39	16 years	BA	Female

**Table 1.** Study Group

## ***Instruments***

An instructor exchange activity training explaining the exchange cycle and procedures was designed to inform instructors. Two instructor self-reflection forms were prepared: one to be used after the exchange and the other for use after the reflection meeting. While the former included questions mainly related the flow of the lesson in the original and exchange classes, the latter aimed to detect generally shared perceptions by the instructors. After the instructors filled out the forms reflecting on their own practices, semi-structured interviews were conducted using an interview form, the questions of which were adapted from Centre for Teaching Support and Innovation (2017).

## ***Data Collection and Analysis***

Instructors were informed about the research procedures with a training including a general presentation about the aims and processes of the activity at the beginning. They made pairs of two and decided the day and slot that they would switch. They were free to apply any kind of activities in line with the pacing of the class. After they finished the lessons, both instructors wrote an individual reflection about the exchange process including short information about their lesson plan and opinions about the similarities and differences of two classes. Also, they were expected to mention activities that worked and that did not work as anticipated. Lastly, two instructors came together and discussed about their reflections, which was followed by filling in the form designed for collecting perceptions after the meeting with the exchange partner. Following the meetings, semi-structured interviews were conducted either face-to-face or through zoom with 10 of the whole population of instructors. That is, while 22 instructors participated in the whole exchange activity, only 10 instructors were interviewed to reach in-depth understanding of their experiences. The interviews lasted around 30 minutes and they were recorded in line with consent from participants. Reflection papers were collected from instructors and semi-structured interviews were transcribed verbatim. The data from semi-structured interviews and reflection papers were analysed by using the steps of thematic analysis (Braun & Clarke, 2006) to determine the themes that would be the light of future CPD activities and criteria of instructor exchange guidance. Instructor Exchange Activity Cycle is illustrated in Figure 1 below:



Figure 1: Instructor Exchange Activity Cycle

## Findings

The themes that emerged from the analysis of interviews and reflection papers are *collegial interaction*, *change in educational context* and *engagement in self-reflection*.

### *Collegial Interaction*

In the scope of collegial interaction, many instructors mentioned how the exchange activity contributed to their learning from their peers in different phases. Regarding the new teaching ideas triggered by meetings with partners, some of the participants explained they gained ideas on warm-up activities to break the ice, reading exercises, group activities and yielding a positive atmosphere in the classroom by turning on the music. Apart from few instructors who stated they could not learn a lot from their partners, nearly all of the instructors stated that they are eager to use their partners' ideas in their future lessons such as classroom management ideas, conducting skill activities in different styles and changing their attitudes towards students.

*"My partner told me she had the students stand while they did the speaking activity. This sounded like an interesting idea. I would be willing to try it."*  
[Participant 19]

*"I think I can use her idea to divide reading into parts to boost student engagement."* [Participant 11]

*"There weren't any new ideas I can integrate into my teaching."* [Participant 8]

Although instructors used a projector, a computer, YouTube, a Digi book, Quizlet, Mentimeter, Padlet, Nearpod, Qr Code Generator, and Google Jamboard as technological tools and applications, 19 participants reported that they did not learn any new technologies during the meetings. Only one participant hoped to use it in the future.

*"My partner has used Nearpod in her lesson as a visual presentation tool instead of PowerPoint. Although I heard of Nearpod before, I haven't used it in my classes. She told me about the advantages of Nearpod. I might consider using it in the future."* [Participant 20]

Except for one instructor, all instructors agreed that the reflection meetings were fruitful in regard to discussing teaching ideas with different instructors and learn from them, observe a different class and to hear about how their own classes perform with a different instructor. Instructors had the chance to look at the teaching material from a different perspective and exchanged ideas. During the meeting, they got the opportunity to explain and justify their teaching style and gain some insights about their partner's teaching style, which gave them the chance to question and reflect on their teaching. Therefore, instructors felt that the meetings were very useful.

*"Learning about what other colleagues are doing in their own classes and how they are teaching the very same material you are teaching in your own class is always stimulating."* [Participant 6]



*“It was comforting to hear that my students were quiet and not so willing to participate in other classes as well. As I mentioned in the post-exchange reflection, I tend to blame myself when students do not actively participate in class. It was also nice to hear that her class was pleased with the lesson they had with me. After this meeting, I felt more comfortable and thought that each class had different dynamics and we should adjust our teaching and expectations accordingly.” [Participant 10]*

*“It is not necessary to observe a teacher in her/his class while teaching; I can do this by only talking to the teacher”. [Participant 12]*

### **Change in Educational Context**

Many instructors stated that the exchange activity was a break from their routine, bringing excitement to their regular schedules. This may be considered one of the reasons why instructors noted mostly positive views towards the instructor exchange activity. They realized that the outcome and especially the process can be very different in two classes, therefore the atmosphere of the class needs to be accepting and open to learning. In order to keep students' motivation level high, instructors should have the ability to be flexible and adapt their teaching accordingly.

*“As a teacher, I enjoyed being in a different class, even for one hour, and doing a planned lesson with different students.” [Participant 21]*

*“What I gained at the end of the day is the fact that students need to feel comfortable with the teacher and affective aspects of the classroom should not be ignored. If I did it all over again, I would probably find a lighter and more fun activity to kick the day off with some energy. Maybe I would go for an activity that involved movement.” [Participant 11]*

Every new practice including a change in educational context comes with its challenges, which was also the case in the instructor exchange activity. Regarding the challenges, not being able to predict how the students would react to an instructor, not knowing what kind of activities would work in a new classroom, not knowing the students' characteristics, their names and exact levels were the challenges stated by instructors. Also, students' unwillingness and hesitation towards speaking, time restrictions, the performance of the students, the difficulty of the content, and students' shy characteristics challenged the instructors. Additionally, instructors had to answer some questions coming from students about the reason of this change and explain the procedure for each late comer again. On the other hand, some of the instructors stated that they did not face any challenges during exchange.

*“Another challenge was not knowing the exact levels of the students. After the class ended, I realized that I had allocated more time than they needed for the 2<sup>nd</sup> and 3<sup>rd</sup> exercises. Unfortunately, because of that, I didn't have any time left for the video activity. If I had known they would do so well, I would have had some time left for the video and the role-play.” [Participant 3]*

As for the successful sides of the lessons, instructors indicated that the lessons were smooth, successful, productive, and effective. Students were eager to join the discussions and answer

the questions related to the activities. Also, use of technology was welcome in the classes. The warm-up activities helped instructors to break the ice. General elicitation questions and brainstorming in pairs were effective practices.

*“It helped me remember how a different audience can change my reactions and management during a class and accordingly I had a chance to be able to adapt my own teaching methods or style in a different classroom environment.”* [Participant 8]

For the differences between the classes regarding student participation, instructors stated that it was highly affected by the proficiency level of the students. While the participation was high in the highly achieved classes, it was lower in classes with lower level of proficiency. In terms of willingness to communicate, all instructors stated that although some students might be shy at the beginning, students were happy and wanted to have a conversation during the lessons. Instructors did not face any problems regarding the flow of the lesson, even though the proficiency level of students could affect the timing of the activities.

*“They were not as comfortable as my own students at the beginning of the lesson, as it was not a situation they were used to and they did not know me, but this situation did not last long. They easily adapted and participated in the lesson.”* [Participant 21]

*“The flow of the lesson differed to some extent. I could teach the exchanged class more fluently and without any student interruption. They followed all my instructions without questioning the activities.”* [Participant 14]

### **Engagement in Self-Reflection**

Finally, most of the instructors had positive insights towards the processes of exchange activity as it became a good way of self-reflection. They said that it created some sort of excitement and got them out of their daily teaching routines. Majority of instructors stated that the activity helped them to reflect on their own practices and evaluate their own teaching with a critical eye. Also, they had a chance to observe what kind of differences may occur in different classes with the same materials and activities.

*“It is a good way of self-reflection. It forces the teacher to leave his/ her comfort zone without feeling intimidated by the presence of an outsider as in the peer observation process, and gain insights on his/her own teaching. Sharing ideas with partners in this exchange activity may help teachers keep their teaching up to date.”* [Participant 2]

*“I understand that it is important to take into consideration the dynamic of that specific class when it comes to preparing the lesson but also essential to not give yourself a hard time in terms of your teaching abilities when something does not work precisely the way you hoped it would.”* [Participant 12]

*“Reflection part was the fruitful part about this activity because there I repeated the same thing, the second time I knew better what I was doing so while reflecting what made it better, I had the chance to reflect upon myself...”*

*so if you were to ask me which part I liked the most I would say the reflection part.” [Participant 1]*

Having the opportunity to see and compare two different classes taught by two different instructors including themselves, in the scope of self-reflection, instructors questioned what worked well and what did not work well in their original and exchange class and made critical evaluations.

*“It actually showed me the teacher talking time was higher in my own class compared to the one in the exchange class.” [Participant 6]*

*“It helped me to understand myself, my teaching style, my abilities or inabilities” [Participant 8]*

*“I’d say it reminded me that in most situations, being flexible and patient is paramount. Rushing through materials, which could have been the case, may lead to students’ not understanding material, ideas, and such.” [Participant 9]*

Critical evaluation of practices naturally led to conclusions and suggestions by the instructors for the design of the activity so that it could make a greater contribution. First of all, one hour exchange was not enough to be able to conduct the lesson plans and build a rapport with students. Secondly, the timing of the class exchanges was not the best as there were exams during the week. The exchanges should be planned in some free weeks. Finally, one time training session did not become so effective for instructors to catch all the ideas of and important facets of instructor exchange. Therefore, there should be longer and a series of training sessions next time.

*“It was a new and nice experience for me since I’d never been in a class exchange activity before. I just think next time this kind of activity is planned, the purpose should be more clear...We need to set an objective or a focus for the exchanged lesson...For example, if I had problems with teacher talking time, I would tell the observer about that and he/she would focus on that in the observed lesson.” [Participant 10]*

*“Maybe the whole experience could result in more reflection if both teachers covered the same material in the exchanged class (e.g. both teachers teaching the same piece of the unit such as reading + vocabulary). So that when they meet again, they can compare their lesson plans and talk about how effective they are.” [Participant 11]*

*“My suggestion is to extend the amount of time that this practice is implemented (between 1 day -1 week) to give the students the chance to get used to the newly introduced instructor and his/her teaching style; thus, lower the negative outcome of the affective filter.” [Participant 20]*

## Discussion and Conclusion

The findings of this study contributed to the professional development practices in higher education context with a specific focus on intensive English education with important implications. First of all, this study proposed an instructor exchange activity by making

necessary arrangements to the extent that it would serve as a means to improve instructors' professional practices and expertise in the context of a School of Foreign Languages. The exchange was realized in the form of a piloting activity, the outcomes of which would then be used to determine whether it would be applicable as a school wide practice. The results of the piloting process indicated challenges, successful practices, similarities and differences between original and exchanged classes in terms of different class dynamics such as student participation, whether the activity led to new teaching ideas and technologies. The findings of this study demonstrated that the instructor exchange activity included the necessary means to stimulate collegial interaction prompting the instructors for cooperative work and self-reflection, which are constituents of effective CPD activities. Furthermore, the activity would be applicable as a school-wide practice taking into consideration the suggestions made by the instructors, which will contribute to specification of the instructor exchange framework in accordance with instructors' needs leading to a more systematic implementation of the activity in the long run. However, this study is not without limitations. First of all, the instructors working in a single state university participated in the study and although 22 instructors were involved in the exchange activity, the number of instructors taking part in the interviews was limited to 10. Also, the findings are based on perceptions of the instructors, which is a restricting factor for generalisation of results to the whole population of instructors teaching in intensive English programs.

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***EmotiMask: Mapping Mouth Movements to an LED Matrix for Improving Recognition When Teaching With a Face Mask***

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**Abstract**

The Covid-19 pandemic has led to the adoption of face masks in physical teaching spaces across the world. This has in-turn presented a number of challenges for practitioners in the face-to-face delivery of content and in effectively engaging learners in practical settings, where face coverings are an ongoing requirement. Being unable to identify the mouth movements of a speaker due to the lower portion of the face being obscured can lead to issues in clarity, attention, emotional recognition, and trust attribution, negatively affecting the learning experience. This is further exacerbated for those who require specialist support and those with impairments, particularly those centred around hearing. EmotiMask embeds an LED matrix within a face mask to replicate mouth movements and emotional state through speech detection and intelligent processing. By cycling through different LED configurations, the matrix can approximate speech in-progress, as well as various mouth patterns linked to distinct emotional states. An initial study placed EmotiMask within a HE practical session containing 10 students, with results suggesting a positive effect on clarity and emotional recognition over typical face masks. Further feedback noted that it was easier to identify the current speaker with EmotiMask, however speech amplification, additional led configurations, and improved portability are desired points of refinement. This study represents a step towards a ubiquitous solution for tackling some of the challenges presented when teaching in a pandemic or similar situations where face coverings are a requirement and has potential value in other sectors where such scenarios present themselves.

**Keywords:** Audio Processing, Covid-19, EmotiMask, Emotional Recognition, Face Masks, LED Matrix, Mouth Expressions, Speech Detection, Teaching & Learning

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## Introduction

The repercussions of the Covid-19 pandemic can be felt across the education sector, impacting the teaching practice of practitioners who had to quickly adapt to a new landscape (Pokhrel & Chhetri, 2021). This was particularly challenging for the face-to-face delivery of content with the various restrictions in place. Face masks or coverings were widely adopted to help mitigate the potential contagion of the virus, becoming mandatory in United Kingdom from 24<sup>th</sup> July 2020. Where face masks are typically mandatory, often learned communication techniques are important to build rapport and garner positive interaction, typically improving outcomes (Crowe, 2020). These types of communication techniques are not necessarily familiar to those who have not had training or dealt with face masks previously, such as many education professionals. By obscuring the lower portion of the face, some of the usual pathways for communication are restricted and mouth movements cannot be seen leading to issues in clarity, attention, and emotional recognition, negatively affecting the learning experience. This is further exacerbated for those who are younger learners or those who may require specialist support, such as learners with impairments, particularly those centred around hearing. In this paper, we present the development of the EmotiMask prototype, where an LED matrix is embedded within a typical face mask to replicate real mouth movements and emotional states through cycling various LED configurations. Direct feedback is gained from learners in an initial study embedded with a HE practical session. The rest of the paper is structured as follows: Related Work discusses present challenges of learning, communication, and expression recognition; the method and systematic development of the prototype are outlined in EmotiMask; Results presents the outcomes from the initial study; Conclusions provide discussion and a look towards future work.

## Related Work

The Covid-19 pandemic has had a profound effect on teaching (Jandrić, 2020), whether it be through the incorporation of blended learning models into existing curricula to support remote access or the restrictions put into place for delivery of face-to-face sessions, such as minimum interaction distance. Here we investigate this impact in three key areas, learning, communication, and expression recognition, with a focus towards the disruption caused by the face mask requirement and how this can be mitigated to support student learning.

## Learning:

Covid-19 has resulted in a rapid transformation of pedagogy in a relatively short space of time (Oyedotun, 2020). Many typical face-to-face learning activities moved online as a means to continue, with the development of solutions to support the transition such as serious games (O'Connor et al., 2021), virtual reality and immersive worlds (Colreavy-Donnelly et al., 2022), and virtual learning environments (Torres et al., 2021). Despite utilising learning theories such as scaffolding, flipped classroom, and active learning, results have been mixed. Some studies show students having a dissatisfied attitude towards remote learning (Torres et al., 2021) and practitioners are noted as having faced difficulties in adapting to the new technologies, with a skills gap identified in some institutions (Hassan, Mirza & Hussain, 2020). In many cases, institutions therefore reinstated face-to-face learning where possible, typically in a blended approach, where measured allowed, albeit with different challenges due to the various restrictions, such as the need for face masks.



Face masks in practice obscure the lower portion of the face, causing issues in some instances with communication due to a combination of speech distortion and the inability to read the speaker (Nobrega et al., 2020). Further studies have shown that smiling broadens cognition and thereby increases creative thinking (Johnson, Waugh & Fredrickson, 2010), however such emotional recognition is not possible when wearing a typical face mask. Indeed, studies suggest face masks amplify the perceived negative emotions of the wearer resulting in increased anxiety, as well as reduced creativity and problem solving (Lyons & Beilock, 2011).

### **Communication:**

The most basic form of human communication is by facial expressions. Humans are biologically programmed to recognise faces (Rivett et al., 2020). The most recent evolution of the human brain has been influenced by this capability to support the transmission of knowledge:

- Teaching – distribution of knowledge (Henrich, 2016)
- Learning – absorption of knowledge (Spitzer, 2020)

The use of face masks then impedes this process, causing noted issues of

- Clarity
- Attention
- Recognition (Emotional)

by reducing the ability to communicate, interpret, and mimic expressions. Positive emotions become less recognizable and negative emotions are amplified. Those suffering from hearing difficulties may find it challenging to recognise who is speaking, for example in a group setting.

### **Expression Recognition:**

Facial expressions form the basis of communication between humans, a simple universal language that is instinctively understood:

- Smile
- Laugh
- Cry
- Joyous
- Unhappy

Studies suggest that the eyes are the facial feature which are engaged with first and for the longest. Second to the eyes are mouth and nose (Spitzer, 2020).

### **Suggested Solution:**

Conceptually, EmotiMask then serves as a potential solution to these challenges through replicating mouth movements and emotional state by applying intelligent audio processing, often utilised for classification tasks (Bielby et al., 2020) and even recently deployed towards pedagogy (Schlotterbeck et al., 2021) and to support various Covid-19 challenges

(Deshpande & Schuller, 2020). EmotiMask utilises an LED matrix to display an animated mouth that is updated in real-time, essentially unobscuring the lower portion of the face to improve overall clarity, attention, and recognition.

### EmotiMask

The first step is to understand what the typical expressions of the mouth are when speaking, focusing on key sounds. A diagram showing the expression for some key sounds is shown in Figure 1. Based on this, patterns which can be represented in an LED matrix were designed, as shown in Figure 2.

A subtle distinction of a nose was also added in a later version of the EmotiMask, shown in Figure 3. This was due to further research expressing the importance of the mouth and nose combined.

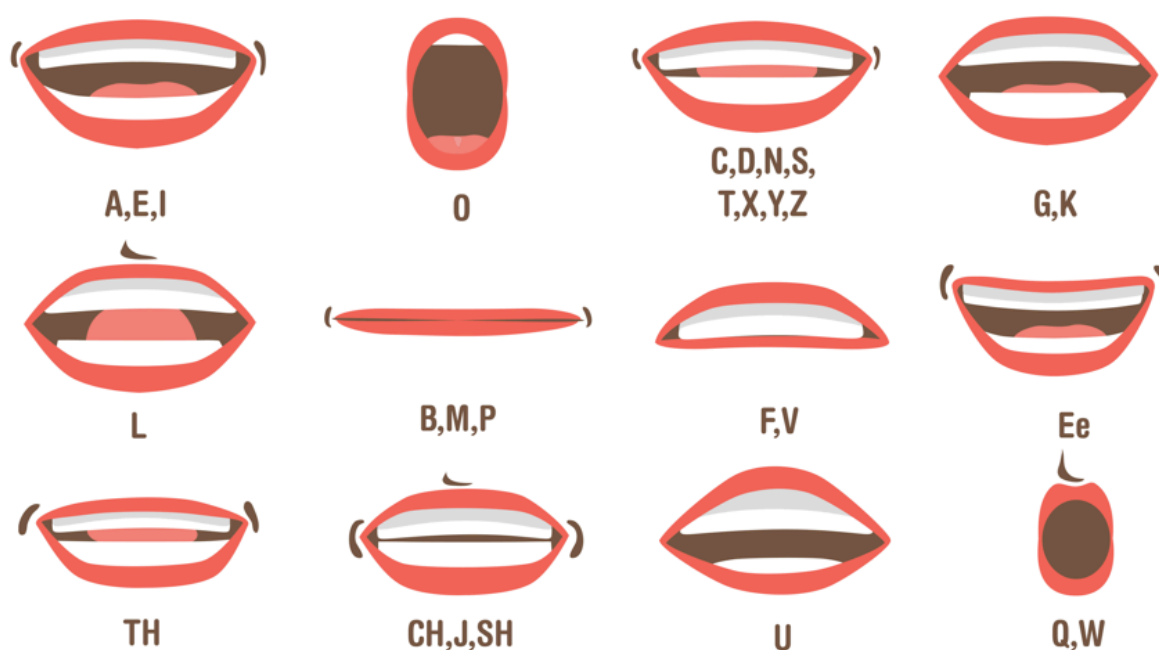


Figure 1: An example of the key expressions and sounds for replicating mouth patterns (image from freepik.com).

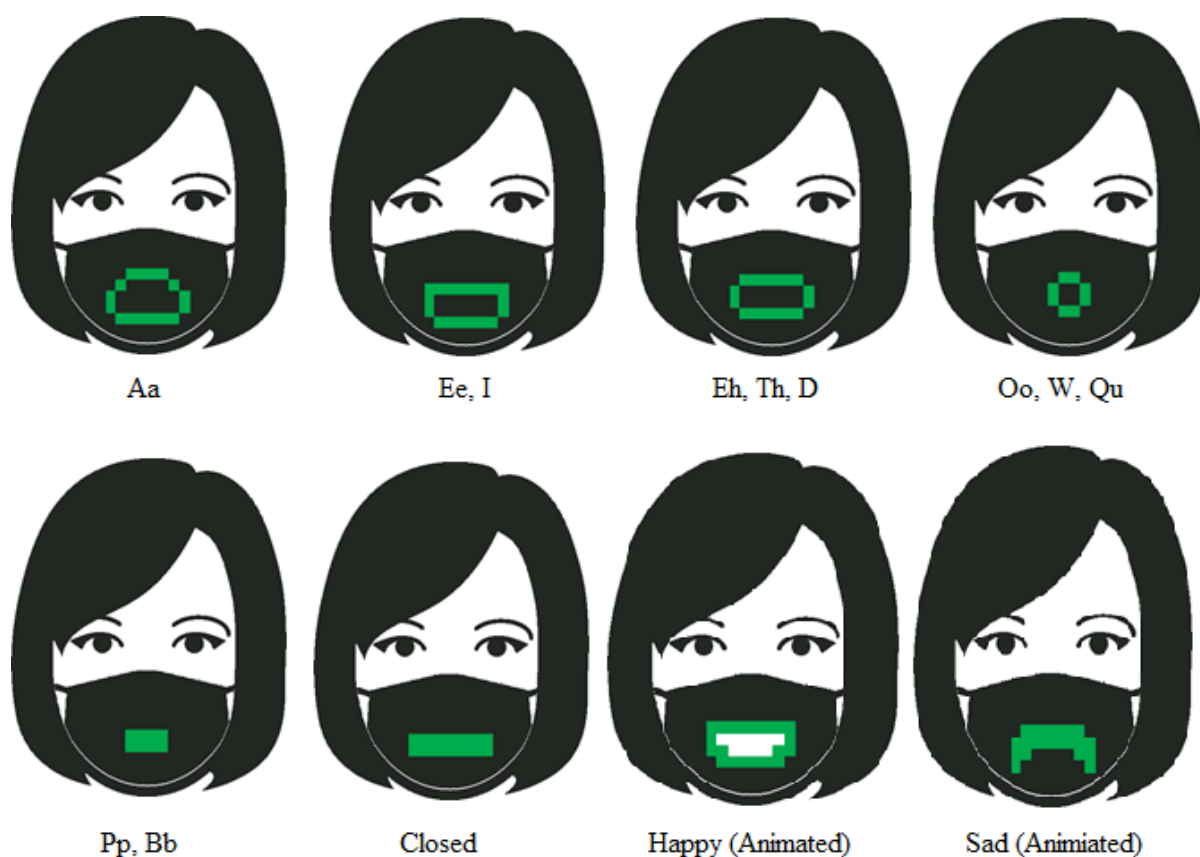


Figure 2: A selection of mouth expression, utilised together with basic emotions for the initial EmotiMask configurations.



Figure 3: Updated versions of the initial configurations included a representation for the nose.

Based on those design decisions, EmotiMask was implemented by embedding an LED matrix within a face mask. An embedded microphone and microcontroller are used for speech detection and intelligent processing. This data is then displayed by cycling through different LED configurations. The matrix can approximate speech in progress and show distinct emotional states.

The following hardware components were utilised to build the prototype for EmotiMask (see Figure 4):

1. Generic cloth face mask
2. Arduino Nano (open-source hardware and software for single-board microcontrollers for building digital devices)
3. 8x8 Addressable RGB LED Matrix (WS2812b)
4. Basic microphone module with built in amplifier and gain pot for adjustments
5. 5.5v USB power pack
6. 10k Ohm Resistor & button

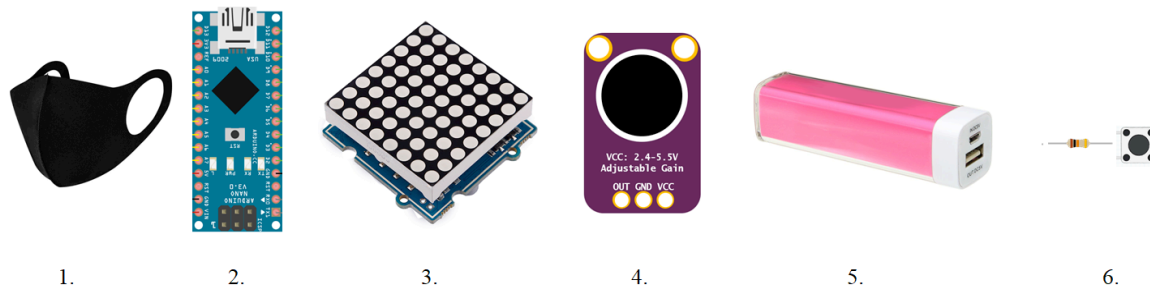


Figure 4: Hardware components.

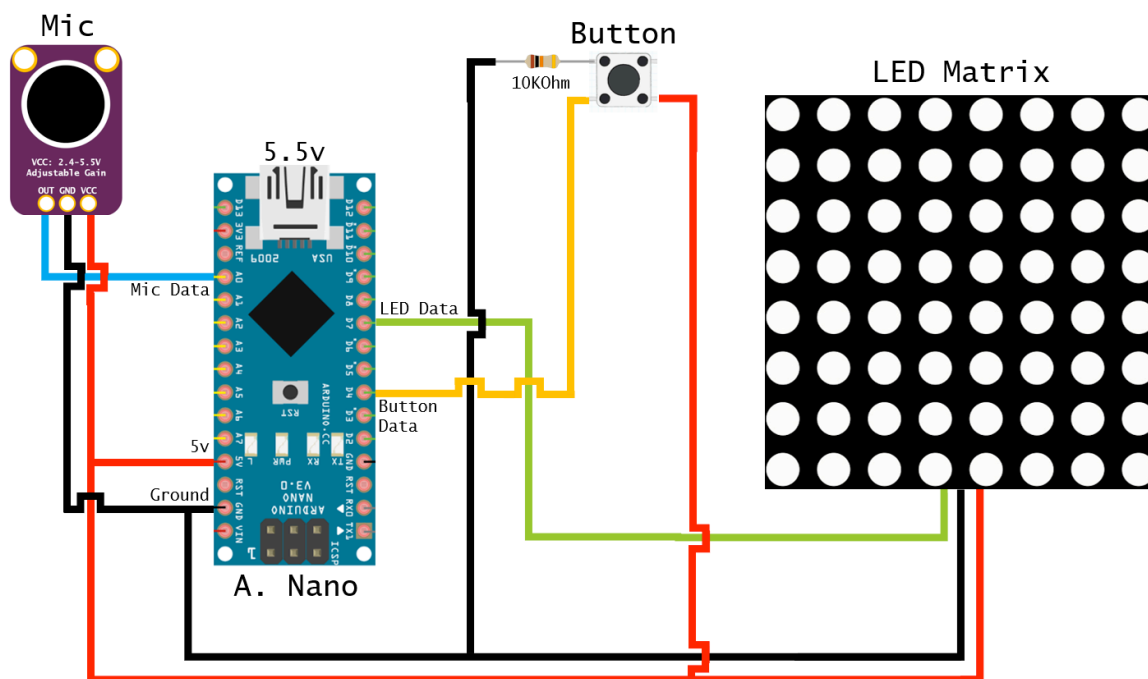


Figure 5: Wiring diagram showing the hardware setup.

The LED Matrix and microphone are placed into the face mask and a wire leads to in-line Arduino Nano. The sealed Arduino Nano on breadboard has an exposed USB port (for power) and button (for settings). Figure 5 shows the overall wiring of the prototype. The final prototype is shown in Figure 6.



Figure 6: EmotiMask hardware Prototype.

Once the hardware was operational the next step is to be able to analyse the voice. The “Speech Banana” (Figure 7) was used to understand the frequencies of sounds when speaking. The diagram plots the phonemes, the basic units of sound in speech, in a grid of frequency (horizontal axis) and loudness (vertical axis). The phonemes used in language fall into a particular area, marked in yellow. Sounds outside this area can be heard, but they were

not considered relevant for EmotiMask which relies on speech as input. The hardware was adjusted to cover the “speech banana”, taking into account hardware limitations and wearer voice.

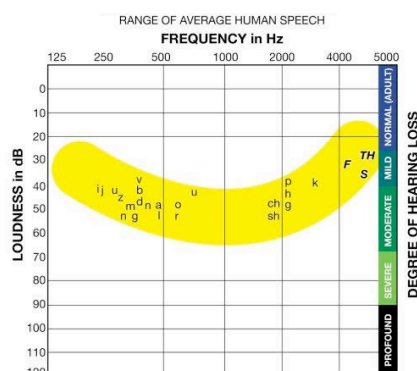


Figure 7: The Speech Banana (Lekashman, 2017).

An Arduino Nano was used as a driver, the microcontroller was programmed with Arduino software (v1.8.13). Two key libraries were used within the EmotiMask Arduino project:

- *arduinoFFT*: A library for implementing floating point Fast Fourier Transform (FFT) calculations on Arduino (Condes, 2020).
- *FastLED*: A library for easily & efficiently controlling a wide variety of LED chipsets (Garcia, 2022).

The FFT is used to transform the speech into a frequency spectrum. The most significant peak of this spectrum is then used, together with the loudness, to identify the spoken phonemes according to the diagram in Figure 7.

The overall process implemented in the microcontroller is given in Pseudo code below. There are a number of helper functions, including a *setup* function to do initialization, and functions (*LEDMatrixOO*, etc.) to set the LED matrix to particular patterns. The function *loop* represents the continuously running program. In particular, it performs the FFT and selects LED pattern.

```
void setup
{
    Arduino Setup
    LED Setup
    Microphone Setup
    LEDMatrixReset()
    LEDMatrixClosed()
}
void loop
{
    ...
    Microphone Analog Signal for 3 loops
    FFT analysis of signal
    Find frequency band peak
    Select Appropriate 'LEDMatrix'
    Delay
}
void LEDMatrixReset{LED Matrix Reset}
void LEDMatrixOO{LED Matrix set to OO}
void LEDMatrixPP{LED Matrix set to PP}
void LEDMatrixAA{LED Matrix set to AA}
```



```

void LEDMouthEH{LED Matrix set to EH}
void LEDMouthEE{LED Matrix set to EE}
void LEDMouthClosed{LED Matrix set mouth closed}
void LEDMouthSmile{LED Matrix set to Smile}
void LEDMouthSad{LED Matrix set to Sad}

```

Additionally, the *Loop* function checks if the button was pressed. Depending on the duration, an expression is shown, overriding the speech pattern:

```

void loop
{
    Short button press
        Adjust microphone sensitivity
    Medium button press
        Cycle LED RGB level
    Long button press
        LEDMouthSmile
        Delay
    Extra-long button press
        LEDMouthSad
        Delay
    ...
}

```

## Results

An initial study placed EmotiMask within a HE computing practical session. During this session normal instruction was conducted while wearing EmotiMask, utilising the full range of configurations (see Figure 8). A period post-session was allocated for students to try EmotiMask themselves and complete a questionnaire relating to the session and mask. The questionnaire contained five Likert scale indicators based on the design, ease of use, clarity, attention, and recognition in comparison to a standard face mask. Three further free-form questions allowed for gathering feedback with respect to positive, negative, and missing elements, as well as a final overall rating for the mask itself. For the five indicators, a score out of 5 was recorded, with a higher score indicating a greater level of agreement on the Likert scale towards that indicator. The overall rating was recorded out of 5 stars, with higher star rating indicating a more positive response. A total of 10 responses were collected from students in the post-session.

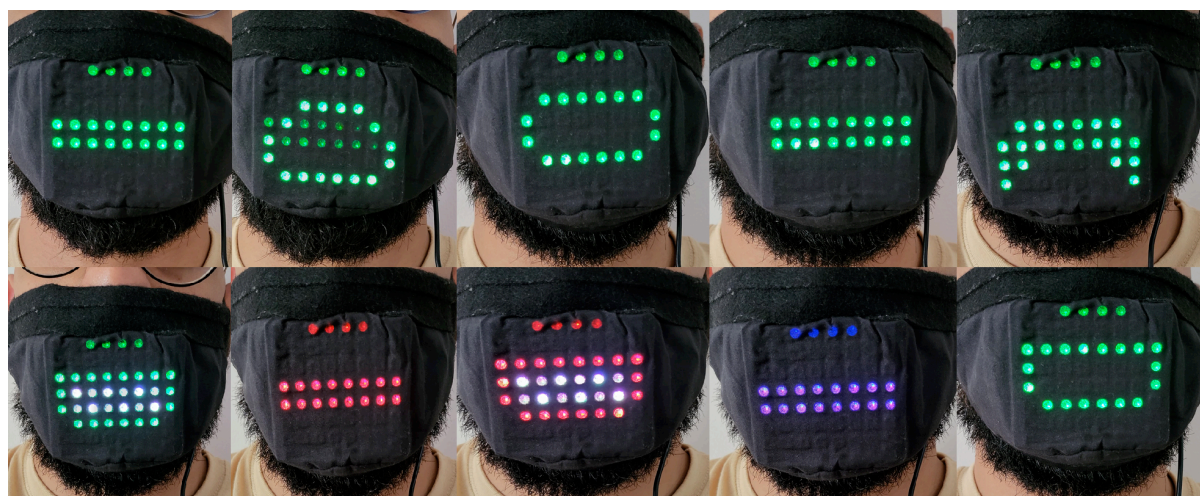


Figure 8: EmotiMask LED configurations and variable settings.

The indicators for design and ease of use both recorded an average response of 4.5 out of 5, suggesting the process of embedding the technology directly within a standard mask resulted in a clear and easy usage experience. It should be noted however that as the sample was from computing students, they would have experience in computing technology and thus would potentially find operating the device easier than students from other disciplines. The indicators for clarity, attention, and recognition, recorded average responses of 3.8, 3.3, and 3.5 respectively, showing a positive response towards the typical areas of concern for teaching with face masks, but also highlighting the potential for improvement. Feedback from the free-form questions supports this outlook, with the responses presented below compiled into two groups, positives and potential improvements:

**Positives:**

- EmotiMask made it easier to identify the current speaker.
- The mask helped students keep focus on the practitioner.
- Those hard of hearing were able to recognise when someone was speaking with the mask.
- EmotiMask enabled a fun, interesting way of communicating despite the face mask requirement.
- The mask was able to take away any confusion on who might be the one talking in a group environment where there was a need to wear face masks.

**Possible Improvements:**

- A larger and higher resolution LED screen to improve visibility.
- EmotiMask could also amplify the speakers voice volume.
- Compact and convenient, wires made it uncomfortable to wear for longer periods of time.
- Greater accuracy of imitating moving lips would make the user easier to understand.

The overall rating for EmotiMask was very positive with an average of 4.2 out of 5 stars across the sample. This response in many ways highlights the challenges of face masks in the learning environment and the potential willingness of students to adapt towards such an intelligent technological solution. EmotiMask shows potential as a supplementary tool to support practitioners in their teaching practice and enhance learning in scenarios where face masks are needed.

**Conclusions**

Here we have presented EmotiMask, a solution to the communication challenges present when teaching with a face mask. It has been identified that through obscuring the lower portion of the face, this can lead to issues with clarity, attention, emotional recognition and trust attribution, when delivering face-to-face content. Through its development, EmotiMask serves a ubiquitous role, being embedded directly within the face covering to maximise ease of adoption and use for practitioners. Extraction of key mouth expressions and emotional states, coupled with intelligent processing for the LED matrix cycles, allows for the replication of the core mouth movements in real-time and the expression of certain emotions. This helps to mitigate the noted issues, with initial results highlighting a positive response in relation to clarity, attention and recognition when compared to a typical face mask. Despite



the positive outcomes, several areas were noted through feedback for improvement, including accuracy, resolution, and comfort. This work serves as the initial steps in EmotiMask's development, with further refinement planned towards the goal of achieving a widespread tool for supporting teaching and learning in conditions where such measures as face masks are required.

Future work on EmotiMask will take several avenues, including the addition and refinement of both mouth expressions and emotional states for improving the overall accuracy of the intelligent processing. At this time, emotional states are selected directly by the user, however incorporating the automatic detection of emotion through artificial intelligence learning solutions would serve to add another layer to EmotiMask and expand on the emotional recognition aspect of the device. EmotiMask currently uses wires to link from the mask itself to the nano controller, which can limit mobility and affect comfort. This and resolution prove challenges in many such wearable devices, including VR headsets, and is an aspect to improve through hardware progression as the device is refined. Finally, integrating EmotiMask into long term teaching curricula will serve to further trial the device.

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*Study on the Establishment of a Structured Library for Clothing Design–  
The Case of Menswear*

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**Abstract**

Students who work in clothing design or study clothing design need to learn clothing design drawings, clothing design drawing as a communication tool prior to manufacture in the clothing industry. Due to the diversification of the attributes, colors and styles of clothing design products, if we do one-by-one sampling, it will not be able to reach the manufacture date, and we will also bear a high cost of it. Therefore, a computer design drawing has become a trend in the design industry. If the clothing that are commonly used in each season which can be classified according to the clothing structure, to create a library which can be assembled or modified when needed. It is like a dictionary with sleeve type, collar type, pocket type, etc. Hence, it will improve the work efficiency, and reduce the cost of making samples, shorten the manufacturing process as well. Therefore, this research will focus on the clothing industry, using the common drawing software to create basic styles of clothing design, to classify style components, and to create a basic library, and try to combine them quickly to create a new style throughout it. Furthermore, the creation of this library can provide designers or workers to improve their work efficiency, but also can be applied to the education which are related to the clothing design and clothing sampling.

Keywords: Clothing Structure, Computer Drawing, Clothing Samples

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## 1 Preface

In the past, I was a designer in the apparel industry and currently teach a class in apparel design and manufacturing at a school.

Besides sampling, clothing design drawing is an important communication tool prior to manufacture. For the education, it is generally called as "mechanical drafting". A complete clothing design drawing can specifically show the appearance, proportions and structural details of clothing styles. In addition to being shown in concept drawings and image boards, it also commonly used in design plans, sample sheets, manufacturing manuals and products classification in the clothing industry. The clothing drawing more focuses on the exact proportions of clothing and the human body, and it is necessary to depict the details of the clothing structure which close to the real object. The benefit of clothing design drawing is let pattern-making, manufacture and marketing department staff more easily understanding the overall clothing structure. Therefore, it will help the market operation going smoothly if the clothing appears on the market.

Nowadays, the uses of computer graphics in the industry can speed up the operation of clothing design drawing. However, the fashion clothing styles are changing with each passing day. Therefore, it takes a long time for designers to work out new styles of the season. How to apply the existing styles into a single basic element? That's why a clothing library is necessary to built out. This clothing style library is like a library of books in different categories, which can be used for reference. Throughout it, as long as the workers classify the existing styles and elements, they can recombine and modify them to develop a new clothing style according to their needs. This will shorten the communication process and accelerate the manufacture schedule.

## 2 Research Motivation and Purpose

Science and technology was not developed at that time, the clothing design drawing was often hand drawn by a fashion designer. (see Fig.1), and the line draft was photocopied into multiple copies, and the color matching as references were provided to the clothing design decision-makers.

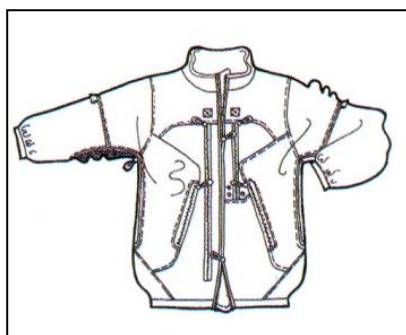


Fig.1. Clothing Structure Line Drawing  
Source : Tatham& Seaman , 2004

In the clothing industry, the pre-work of clothing design and development is complicated. For example, searching for the fabrics and colors of the seasons to making samples, and confirming the final styles. Normally, it takes much time, and the hardest matter is to cope with the rapidly changing market. Hence, in order to quickly respond to consumer's feedback, it is necessary to speed up the clothing design and economize the sampling time in order to shorten the manufacture period, and to get more business opportunity. Therefore, the sample clothes and the clothing design drawing are the best communication tools. However, the hand-drawn clothing design is often difficult to conform to the designer's ideas and drawing style. It takes a lot of time to produce a color close to the fabric. In order to effectively provide more definite styles for decision makers to decide clothing styles or buyers to place manufacture orders, therefore a clear clothing drawing is indispensable. The "clear" defines some requirements which are proportions, colors and patterns, and detailed design that are close to the actual product.

There are often multi-color products in the same style in the market. In the past, the company's takes order, if the designer only provide a sample of a single color, and even if another color product was pre-listed in text or provided with a cloth sample, it will make the people hesitate to move forward, so that the companies often lose many orders. At this time, if there is a complete and clear clothing drawing, it will make the order to further their interests. On the other hand, it can also provide the needs of the manufacture and marketing process.

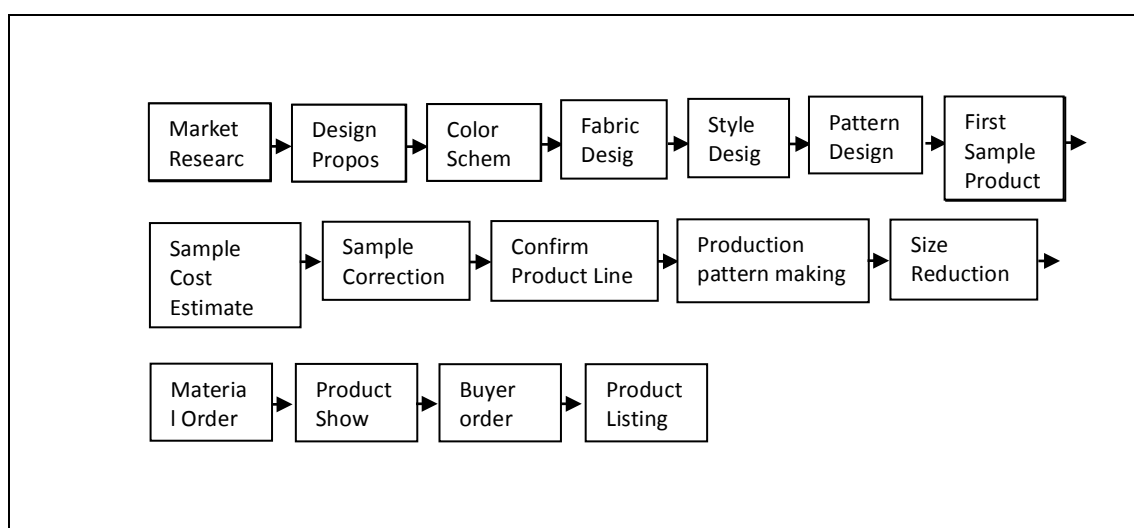


Fig.2. Clothing Design Development Process  
Source : This Research

### 3 Research Scope

Due to the diverse categories of casual clothing, there are different sizes, structures and design of the clothing styles. So that, this research only takes men's casual clothing as the main research object, and establishes a library of clothing style elements, to construct a clothing design drawing. It uses CorelDRAW® vector drawing software as the drawing tool.

### 4 Research Methods

The document analysis is used as a research method to collect common styles in the clothing

industry. Besides, the researchers' past practical work experience as a supplement to explore the clothing development process and procedures as well. A method is proposed to fulfil the needs of clothing industry, and to solve the clothing design workers' problems when doing the clothing design drawing. Therefore, a clothing style library is established by experimental practice for the operation, it can be applied to clothing designers and clothing design education.

## 5 Research Contents

### 5.1 Literature Review

#### A. *Clothing design drawing*

The clothing design drawing is a communication tool among the clothing industry departments. When a designer presents their clothing drawing to them, it must be able to precisely interpret the designer's design concept, and be able to reproduce and manufacture the clothing completely. There are some functions in the clothing drawing. According to Tatham & Seaman, its characteristics are as follows: 1. Aided creative ideas 2. Re-interpreted existing designs 3. Clear manufacture techniques and details 4. Actual size and proportion.

The clothing design drawing can enhance to depict the details of the clothing; or as a part of the creativity, it can also be used to link the original design of the existing clothing. Tatham & Seaman said, "As a designer, a clothing design drawing shows his ability in his portfolio, it is a useful technique skill, because most of commodity-oriented designers will use the design drawing to express their designs." (Shen Shuru, Min 2004) The first principle of drawing a design drawing is to be clear and precise, it will be able to convey the composition, proportions and decoration of the clothing design effectively.



Fig.3. Hand-drawn Clothing Design  
Source: Researcher

The clothing design drawing is mainly focuses on the exact proportions of the clothing and the human body, and it also needs to depict the details of the clothing structure that are close to the real object. In the industry, it is generally called "clothing drawing" as shown in Figure 3. "Clothing design drawing" is also known as a "mechanical drafting" in clothing education. It is an important communication tool for the clothing industry when deciding to place an order. It is not only shown in concept drawings and image boards, but also often used in



design projects in the clothing industry, such as manufacture manual or Production Plan Summary (See Fig.4), sample sheet, Product manufacturing instructions (See Fig.5) for design and marketing department to understand the styles of the season. In addition, if a designer proposed his idea to clothing industry series, it is usually necessary to attach a clear and precise proportioned clothing design drawing, which assists in explaining the design lines and details of the clothing, includes the color of the pattern. Therefore, the design drawing must accurately depict the composition of the clothes, all the details, decoration and the finishing method. In order to make a complete clothing design drawing, the designer will carefully consider each problem and solution, otherwise there will be uncertainty.

號:115117-101 主:黑,橄綠 SIZE:6-18 量:680 搭配:	貨號:115118-101 主:灰,淺綠 SIZE:6-18 數量:970 搭配:	貨號:115119-101 主:灰,卡其 SIZE:6-18 數量:1100 搭配:	貨號:115120-101 主:灰,淺綠 SIZE:6-20 數量:1260 搭配:	貨號:115121-101 主:灰,卡其 SIZE:8-20 數量:1100 搭配:
料:25'1*1羅紋布	主料:25'1*1羅紋布	主料:32'左右燃單面布	主料:25'1*1羅紋布	主料:Pk組織布
布商: 森茂 繡印花階段: 2 價格:	布商: 森茂 繡印花階段: 3 價格:	布商: 森茂 繡印花階段: 3 價格:	布商: 森茂 繡印花階段: 2 價格:	布商: 台文 繡印花階段: 2 價格:
號:115124-101 主:水藍,粉紅 SIZE:6-18 量:500 搭配:	貨號:115125-101 主:白,粉紅 SIZE:6-18 數量:500 搭配:	貨號:115126-101 主:水藍,灰 SIZE:6-20 數量:1160 搭配:	貨號:115127-101 主:白,粉紅 SIZE:6-20 數量:1100 搭配:	貨號:115128-101 主:白,灰 SIZE:8-20 數量:780 搭配:
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號:115129-101 主:藍,紅 SIZE:8-18 量:660 搭配:	貨號:115130-101 主:藍,灰 SIZE:8-18 數量:920 搭配:	貨號:115131-101 主:藍,灰 SIZE:6-20 數量:1240 搭配:	貨號:115132-101 主:水藍,卡其 SIZE:6-20 數量:1520 搭配:	貨號:115133-101 主:紅,卡其 SIZE:2-20 數量:1580 搭配:
料:Pk組織布	主料:25'S亂紋單面布	主料:25'S自動變色條紋布	主料:30'S花紗單面布	主料:條紋單面布
布商: 台文 繡印花階段: 3 價格:	布商: 晉嘉 繡印花階段: 3 價格:	布商: 大織 繡印花階段: 3 價格:	布商: 大織 繡印花階段: 2 價格:	布商: 台文 繡印花階段: 2 價格:
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布商: 台文 繡印花階段: 2 價格:	布商: 台文 繡印花階段: 2 價格:	布商: 台文 繡印花階段: 2 價格:	布商: 台文 繡印花階段: 2 價格:	布商: 森茂 繡印花階段: 2 價格:

Fig 4. Production Plan Summary  
Source: Researcher/S.B.POLO



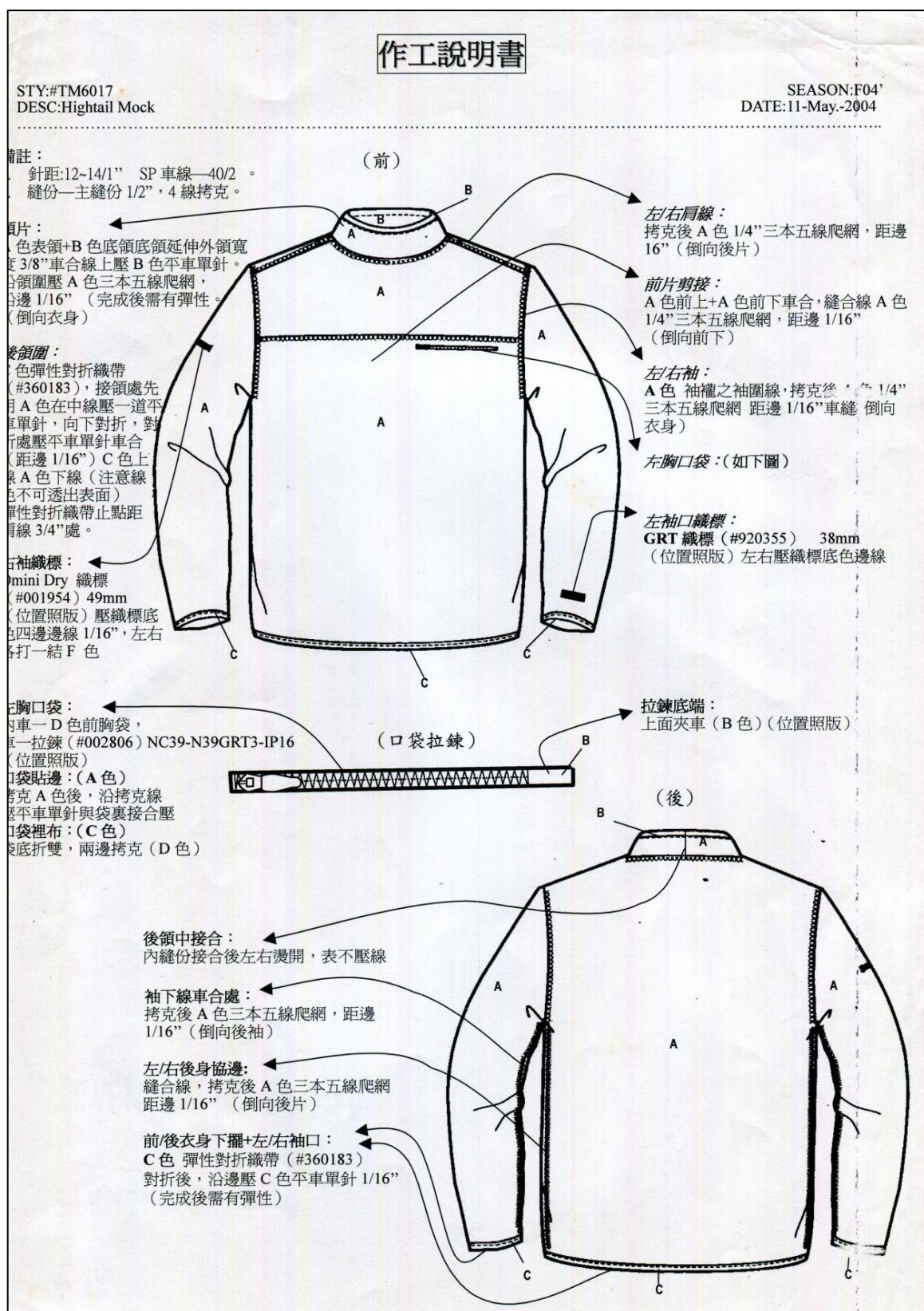


Fig.5. Product manufacturing instructions

Source: Researcher

## ***B. Clothing design drawing and body proportions***

Before proceeding with the clothing design drawing, the first we must to understand the proportions of the human body. Kumagai Kojiro (1990) believes that we have to understand it before drawing a clothing design. As a fashion designer, the basic requirement is fulfill the creativity to establish new ideas or to break the traditional conventions. However, sometimes it is very useful to abide the existing design principles. Therefore, no matter how imaginative the source of inspiration or information to explore, the final destination must be on the human body. Tatham & Seaman believes that as a clothing designer, they must always remember that a real person to wear the clothing. Therefore, it is important for a designer to understand the structure and proportions of the human body (Shen Shuru, 2004).

## ***C. Computer aided design and clothing design***

Computer aided design (CAD) defines the use of a computer as a drawing tool to draw the graphics. The way to compose graphics on a computer can be divided into a bit-based drawing system (Paint System) and a vector-based drawing system (Cad System). Computer drawing systems can be divided into two-dimensional drawing (2D) and three-dimensional drawing (3D). Two-dimensional drawing is also called graphic drawing. Common drawing software such as Photoshop<sup>®</sup>, CoreDRAW<sup>®</sup>, Illustrator<sup>®</sup>, PhotoImpact<sup>®</sup>, Painter<sup>®</sup>, little painter and other drawing software. The three-dimensional drawing is usually used in engineering drawing, interior design, industrial product design, such as AutoCAD<sup>®</sup>, form-Z<sup>®</sup> and other drawing software.

This research is based on the vector computer CoreDRAW<sup>®</sup> drawing software. It does not take the point as the recording unit, but the drawing element as the recording unit. The graphics are called vector graphics. Vector drawing uses basic shapes to combine graphics. The drawing elements include points, straight lines, continuous straight lines, circles, rectangles, and so on. Each graphic shows the position, size, direction and other information of the drawing element used in the graphic. Vector graphics shows the sequence of each graphic element, and the graphics will be displayed in sequence on the screen. Each element can be copied, moved, modified, deleted, or added new graphic elements. Vector graphics will not be distorted when zoomed in or rotated.

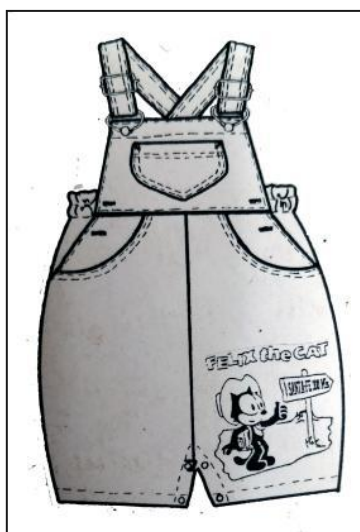


Fig.6. Hand-drawn clothing design  
Source: Researcher/Felix the cat

In the traditional hand-drawn clothing design (See Fig.6), the designer needs to go through multiple steps such as depicting the outline, fabric texture, detailed structure, and coloring. The pattern relies on the finalized thumbnail of the pattern designer in order to complete a clothing design drawing, so that these processes are really time-consuming and laborious. A hand-drawing is also difficult to grasp because of the proportional size, and if you want to replace the cloth pattern or color of the same style, you need to redraw a design drawing. Besides, the differences in the drawing techniques of each designer can easily lead to misjudgments by downstream workers, such as pattern-makers and samplers, it resulting in communication delays, imbalances in the design timing of derivative products, and even loss of corporate organizations. As the scholar Chen Fen-ling mentioned, in the past, hand-drawn clothing design was time-consuming and laborious. For example, in terms of coloring, if coloring of a design draft is not smoothly, the entire artwork will be discarded, and the repeated execution will cost more. However, it's not easy to try different color combinations because you have to copy many images and try to make them in different color combinations (Chen Fen-ling, 1996). At the same time, you can't get the actual effect of the finished product right away. If a computer-aided design system is used, the design creativity can be quickly expressed in a short time, and the color and structure of clothing can be unlimitedly changed. The use of computer aided design provides fashion designers with a convenient and effective environment when designing styles.

The two major advantages of computer aided design are 1. Shorten the design time and 2. Experiment of different design ideas to achieve creative results. The use of vector graphics in clothing design includes style description, pattern design, striped flower design (See Fig.7, Fig.8), display design, catalog design, and project planning. It can also be used with Painter<sup>®</sup> drawing software for the design and texture of plaid fabrics, as shown in Fig.9. Such drawing software includes CorelDRAW<sup>®</sup> owned by Corel and Illustrator<sup>®</sup> and FreeHand MX<sup>®</sup> produced by Adobe.



Fig.7 Jacquard Wool Vest Vector Style  
Computer Clothing Design Drawing  
Source: This Research





Fig.8. Stripped Knitted Top Vector Style  
Computer Clothing Design Drawing  
Source: This Research



Fig.9. Plaid Weave Shirt Vector Style Computer  
Clothing Design Drawing  
Source: This Research

## 6 Results and Discussion

The clothing design drawing focuses to achieve the purpose of communication, so that no matter the designer or upstream and downstream workers, they can communicate well through a clear clothing design drawing to achieve the ultimate manufacture and sales goal. This research focuses on the men's clothing industry to explain the categories and different ways of styles in the clothing industry. Then, create a structure diagram of classified styles, and give examples to complete the clothing design plan of shirt styles. According to the style components, create a gallery to facilitate the clothing design work to fulfill the needs of the person.

## 6.1 Men's Clothing Size

Due to the climate, customs and culture of various places, the menswear industry develops clothing styles every season, which are mainly divided into two, they are spring and summer, autumn and winter. Generally speaking, men's casual wear size based on their height and weight, as shown in Table 1. However, this is for reference only. Because, there are some exceptions, some industries will refer to the key parts of the clothing style, such as the hip or waist size, etc. For example, for pants, the waist is used as the size. For example, 34 means that the waist circumference is 34 inches.

Weight (kg) \ Height (cm)	155~160	160~165	165~170	170~175	175~180	180~185
45~50	XS	S	M	M	L	L
50~55	XS	S	M	M	L	L
55~60	S	S	M	M	L	L
60~65	M	M	M	M	L	L
65~70	M	M	L	L	L	XL
70~75	L	L	L	L	XL	XL
75~80	L	L	L	XL	XL	XL
80~85	L	L	XL	XL	XL	XL
85~90	L	L	XL	XL	XL	XXL
90~95	XL	XL	XL	XL	XXL	XXL
95~100	XXL	XXL	XXL	XXL	XXXL	XXXL
100~105	XXXL	XXXL	XXXL	XXXL	XXXL	XXXL

Table 1. Table of Comparison Men's Clothing Size  
Source: This Research

Category	Trousers	Tops		Vests	Coats
Style structure	Elastic Waisted Shorts	Ribbed Crew Neck Short Sleeves	Ribbed Crew Neck Long Sleeves	Collared Vest	Collared Jacket
	Elastic Waisted Shorts	Rolled Round Neck Short Sleeves	Rolled Round Neck Long Sleeves	Collarless Vest	Baseball Collared Vest
	Casual Shorts	V Neck Short Sleeves	V Neck Long Sleeves	Hooded Vest	Collarless Jacket
	Casual Pants	Polo Collar Short Sleeves	Polo Collar Long Sleeves	Seam Binding Vest	Hooded Jacket
	Slim Fit Trousers	Polo Collar Raglan Sleeves	High Neck Long Sleeves	-	-
	Casual Trousers	Shirt Collar Short Sleeves	Shirt Collar Long Sleeves	-	-
	Elastic Waisted Flat Pants	-	-	-	-
	Elastic Waisted Trousers	-	-	-	-

Table 2. Classification of Men's Casual Clothing Style Structure

Source: This research

The research objects are men's casual clothes, and the styles can be roughly divided into tops, trousers, vests and jackets. Each type of style is divided into various styles according to the different details of the design. There are many variations of clothing styles. The name of each style is set as the structural name of the style based on its appearance or structure style difference See Table 2.

## 6.2 The Construction of Clothing Styles Drawing

CorelDRAW<sup>®</sup> drawing software which is a vector graphics editing software developed by Corel Corporation. Initially, CorelDRAW<sup>®</sup> was developed and run on the Windows version. Because of its relatively low cost, now it is widely used by the clothing industry. Indeed, it has been in clothing development and design for a period of time. Currently, there is an increasing trend in clothing industries which are using similar software.

Therefore, this research hopes that clothing education can also offer such clothing drawing courses to close to the clothing industry. The following is a menswear clothing design drawing based on the basic common styles in the industry development. These style drawings are based on the CorelDRAW<sup>®</sup> drawing software, using the "hand-drawn tools" and "Modelling tools" in the toolbox. The classification of men's casual clothing styles, which established as a style library, See Table 3, Table 4, Table 5, and Table 6.















<b>Tops</b>			
Ribbed Crew Neck Short Sleeves	Rolled Round Neck Short Sleeves	V Neck Short Sleeves	Polo Collar Short Sleeves
			
Ribbed Crew Neck Long Sleeves	Rolled Round Neck Long Sleeves	V Neck Long Sleeves	Polo Collar Long Sleeves
			
High Neck Long Sleeves	Shirt Collar Short Sleeves	Shirt Collar Long Sleeves	Baseball Collared Raglan Sleeves
			

Table 3. Drawing of Men's Casual Clothing Styles-Tops

Source: This research

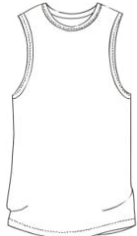


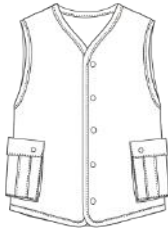
<b>Vest</b>			
Round Neck Vest	Round Neck Oversize Vest	V Neck Button Front Vest	Rolled Button Front Vest
			

Table 4. Drawing of Men's Casual Clothing Styles-Vests

Source: This research





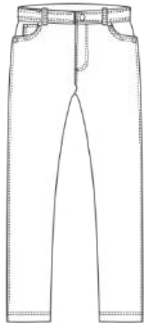
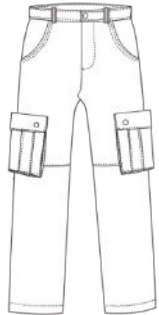
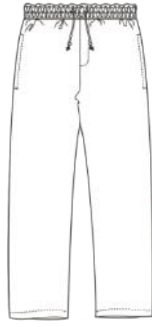

<b>Pants</b>			
Shorts	Pants	Elastic Waisted Shorts	Elastic Waisted Casual Pants
			
Fitted Trousers	Casual Trousers	Elastic Waisted Flat Trousers	Elastic Waisted Drawstring Trousers
			

Table 5. Drawing of Men's Casual Clothing Styles-Pants

Source: This research





<b>Jacket</b>			
Collared Jacket	Baseball Collared Jacket	Collarless Jacket	Hoodie Jacket
			

Table 6. Drawing of Men's Casual Clothing Styles-Outerwear

Source: This research

### 6.3 Establishment Clothing Style Drawing Components

The establishment of clothing design drawing style varies greatly due to different styles. The similar style structure can be combined or modified using the copy function of the drawing software to achieve the purpose of style reconstruction. In order to achieve this goal, the style can be deconstructed. The garment structure is composed of many different and single elements. These elements are collars, sleeves, pockets, front pieces, back pieces, zippers, etc. The collars can be divided into shirt collars, round collars, polo collars, etc, while the pressure line can also be divided into single pressure line or double pressure line. The details of the clothing structure can be described as numerous, for example the shirts. So that, we will create a drawing file of its style components. The drawing file can be adjusted individually according to the needs of the designer. It can also be flexibly reduced or expanded according to the mode of editing the library and referring to the current design in time. See Table.7.

















Shirt Style Components			Clothing Design Drawing
	Components	Pressure Line Combination	Front Side
Collar			  
Sleeves			
Cuff			
Pocket			
Front Piece & Crimping Button			
			
Back Piece			Graphic Print Design
			

Table 7. Menswear Shirt Style Elements  
Source: This Research

## 7 Conclusion

The process of clothing design is complicated, no matter it is fabric sewing or the design process through paper, pen or computer drawing, it is constructed step by step throughout many details. Therefore, the clothing design drawing plays an important role in the design process, because it is clearly to show the presentation of every details of the clothing design. Today, there are diversified styles of clothing design, in order to meet the preferences of different consumers, it is often necessary to speed up the design and production process. In order to respond to changing market demands, a rapid design skills and manufacture system are important matters in the clothing industry. Therefore, this study establishes a garment style library that can not only improve the design efficiency of workers but also increase the productivity of the industry.

Due to space limited of this research, it could not present the various styles and components one by one. Furthermore, the shirt styles of men's clothing actually are more than what this research presented. However, the research will follow up the other clothing, just like women's, uniforms, or maternity clothes. The long-term accumulation of clothing designers can surely to make a comprehensive and easy-to-operate the library. The choice of drawing tools software which used in this research are CorelDRAW<sup>®</sup>, they can be extended apply to the clothing design.

For the education, if clothing teachers can good use in computer aided design and establish a complete education gallery, it will allow learners to quickly enter the learning field and increase their interest in the cognition of clothing structure and design style changes. In addition, the researcher had tries to introduce the curriculum of clothing composition and manufacture, and do a questionnaire survey to the students about their learning needs. The results show most of them are feel very interested in this and they believe that it could improve the efficiency of clothing design. Now, What must be considered is the increase in knowledge which corresponding to the study hours, or try to combine it with general computer aided design courses, this operation might will shorten the distance between industry and academic.

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## Resources

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***The Relevance of Technical Vocational Education and Training Skills in  
Meeting the Market Demand in Eswatini***

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Official Conference Proceedings

**Abstract**

There are several types of technical vocational education and training (TVET) skills offered to offenders who are incarcerated in correctional services worldwide, Eswatini included. The paper presents the findings about the relevance of TVET skills offered to offenders in meeting the demand of the market in Eswatini. The research questions were: What type of vocational skills have ex-offenders used after their release from custody? How have ex-offenders used the acquired vocational skills after release from custody? Based on the interpretive paradigm using qualitative approach, individual interviews were conducted with four facilitators and 12 ex-offenders who were purposively chosen. The data were analyzed using qualitative content analysis and ethics were considered. The findings revealed that the Correctional Services provides various TVET skills to offenders such as: building construction, leather crafting, auto electrical. It was established that the criteria to select the offenders to various trades was based on offenders' past experiences, their personal interests and level of education. Ex-offenders further reported that they used the TVET skills to get piece jobs, secure employment while others said they did not use the skills. Recommendations made are to: hold regular awareness campaigns about re-integration of ex-offenders to their communities and the establishment of partnerships with private sectors where ex-offenders could easily be employed after their release.

**Keywords:** Technical Vocational Education and Training (TVET) Skills, Ex-Offenders, Market Demand

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## Introduction

The paradigm shift from prisons to correctional centers with an overarching goal of rehabilitation and reintegration of offenders using TVET skills envisaged to change their lives and equip them with work-related skills and reduce recidivism (Vandala, 2019). However, studies have shown that there is an old divide between the custodial officers and training officers that has prioritized security over rehabilitation programmes (Ntshangase, 2015; Ngozwana, 2017; Dlamini, 2020). Moreover, Dlamini (2020) assessed the impact of correctional programmes in integrating offenders back to society and found that insufficient training apparatus, lack of finances for operational costs for TVET programmes and staff turnover were affecting the programmes offered to offenders in Eswatini. It has been noted that correctional centers experience overcrowding due to re-offending that Shongwe (2014) established to be the cause for committing crimes for survival. This is despite the effort of TVET programmes that are provided to offenders that aim at preparing them for the integration through availing opportunities that can enable them to engage meaningful work, programmes and activities that have relevance to their life outside correction (Correctional Wheel, 2020). Hence the study was conducted to assess the relevance of TVET skills offered to offenders in meeting the market demands in Eswatini. The objectives were to determine the type of vocational skills used by ex-offenders after their release from custody; and to find out how ex-offenders have used their vocational skills after their release from custody. The study will make recommendations that might improve the TVET programmes offered to offenders in correctional centers in Eswatini. Furthermore, the study might contribute to the field of study regarding how TVET skills could be provided in a manner that can benefit offenders and the other stakeholders in Eswatini. The paper is organized into the following headings: literature review, methodology, findings, and discussions before the concluding remarks.

## Literature Review

Nkwanyane, Makgato and Ramaligela (2020) postulate that TVET colleges serve to impart skills and develop youth and adults with relevant skills for transition into the world of work. Technical and vocational training and education focuses on the mind, the heart, and the hand of trainees to be innovative entrepreneurs and be able to respond to the developmental needs of a society (Chakamba, 2019). The TVET skills are known to empower people with self-reliance and employable skills, therefore must strive to produce competent learners who will respond to the needs of both employers and consumers.

## TVET Programmes for Offenders

The goal of the TVET programme is to reduce the rate of re-offending and facilitate smooth entry into the communities after incarceration in Eswatini correctional centres (Correctional Wheel, 2020). In the context of Canada, Mohammed and Mohammed (2015) established that reducing re-offending through vocational skills yielded positive results as recidivism was lowered among offenders who had enrolled in TVET programmes than those who did not enrol in those programmes. This could probably be the case with offenders in Eswatini correctional centres, particularly if their TVET skills could meet the market demands, which this study would establish. Mohammed and Mohammed (2015) stated that offenders in Canada were provided with vocational skills such as computer repair, cosmetology, electrical trades, floor covering, painting, upholstery, and welding. Similarly, Zoukis (2015) indicated that in New York, offenders were offered adult basic education, cell study, computer assisted



instruction to offenders who entered the Department of Corrections and Community Supervision who are without a verified high school diploma or its equivalency. Zoukis stated that vocational skills training such as building maintenance, carpentry, plumbing, radio/TV repairs and small engine repairs were provided to offenders in partnership with some industries (Zoukis, 2015). Zoukis underscored that the partnership aimed at linking the acquired skills from the correctional centre with the demand of the world of work.

In a study that Munishi and Emmanuel (2016) conducted in Tanzania about factors contributing to lack of employable skills among TVET graduates, it was found that lack of job competencies resulted from poor training from TVET institutions because of incompetent teachers and inadequate facilities. Munishi and Emmanuel (2016) found that the labour market was changing rapidly due to technological advancement therefore, the TVET college curricula ought to be aligned in a way that will serve the rapid market demands. Munishi and Emmanuel also found that TVET lecturers needed to continuously update their skills so that they can be at par with the dynamics of the market demand; and last, to provide the career guidance in TVET to help the learner career path. In view of the above, this suggests that vocational curricula infused with technology be drawn up in conjunction with partners from the world of work, TVET teachers, and students so that TVET graduates could meet the expectations of the labour market (Munishi & Emmanuel, 2016). Moreover, Zarina et al. (2016) postulate that technology use and the internet have become a necessity and seen as appropriate for the twenty-first century skills. This is also supported by Raihan (2014) who opined that satisfactory partnership between (TVET) institutions and industries would have an advantage to the provision of relevant practical skills for economic growth.

### **The Relevance of TVET skills to market demand**

The relevance of TVET skills with the market demand cannot be overemphasized. This is in line with what Aluoch (2021) suggest that TVET institutions should work tirelessly to ensure that their trainees deliver what the consumer or employer needs when the former join the industry. This can be possibly achieved if there is collaboration among the industries and the education institutions (Raihan, 2014) that are offering vocational skills. In that way, the relevance of vocational technical skills to the demands of the market could be guaranteed. It has been indicated that TVET institutions need to reinforce links with industries as to enhance networking between academia and industries (Raihan, 2014). The author highlights the importance of partnerships by TVET institutions with the market as both can create a better understanding of each other's requirements and to recognize how they can be met through the industry programs (Raihan, 2014). The suggestions by Raihan (2014) are confirmed by the findings of the studies by Aluoch (2021) and Ngure (2015) in Kenya about the need for collaborative partnership model initiative that can bridge the existing gap between the provision of vocational technical skills and the relevance to the market industry.

In Eswatini Correctional Services, efforts to integrate offenders back into the society is done through placement, which the Correctional Wheel (2020) stipulates that an offender must be placed to facilitate the transfer of learning by engaging them with full practical. The placement of offenders to different industries is hoped to facilitate the easy means to adapt to their communities by utilizing the vocational technical skills effectively, either as self-employed or joining paid employment (Dlamini, 2020; Ntshangase, 2015). Similarly, Lindeman (2017) assessed ex-offenders' pathways post their release in Australia who had completed their TVET programs while in custody. Lindeman found that the ex-offenders were able to use their TVET skills by getting piece jobs from their peers, family members,

community members, neighbours while others got full time paid employment, which made their trades to remain relevant to the changing world of work. What Lindeman (2017) found is different from what happens in some of the Eastern Cape TVET colleges where Sixabayi (2016) found that there is a mismatch between what is offered as curriculum and what the labour market wants. This possible gap between what is expected as outcomes from the TVET and the market demand is what led to this study in the context of Eswatini.

## **Methodology**

The study was situated under the case study design which was deemed appropriate for the research problem (Creswell, 2014). The case study design was used as it provides more realistic responses (Yin, 2009) as it focuses on gaining an in-depth understanding of a phenomenon at a specific time. Qualitative approach was used because it allowed the participants being ex-offenders, to elaborate on and unpack the information pertaining to what vocational skills they have used and how they have used them. Based on the qualitative nature of the study, non-probability sampling was used (Rahi, 2017) where both convenience and purposive sampling techniques were applied to choose the TVET facilitators and the ex-offenders who participated in the study.

Correctional facilities are highly security-controlled environments; therefore, the researcher communicated her research needs to the correctional officials who served as facilitators and liaisons in the study, also for triangulation purposes. Four facilitators were chosen based on their availability and readiness to participate in the study as per their convenient flexible time (Bryman, 2012). They were interviewed at their workplace in different times with interviews lasting for less than thirty minutes per individual. Ex-offenders were selected by the facilitators using purposive sampling that required key informants that are knowledgeable and with the experience of the TVET skills (Leedy & Ormond, 2015). Different facilitators accompanied the researcher to the homes of the ex-offenders who were available and showed willingness to participate.

The facilitators and the twelve ex-offenders gave their informed consent to participate by responding to the face-to-face individual interviews using a semi-structured interview guide that was separate for both facilitators and the ex-offenders. All the participants were males because they were previously release from a facility that kept only males in that custody. Therefore, all the facilitators were males too. The interviews were held in SiSwati, a vernacular language understandable to all participants. Later the transcripts were completed in English language for easy data analysis using qualitative content analysis (Elo & Kyngas, 2008) process. Four principles of ethical conduct for research with people – confidentiality; anonymity, privacy, and voluntary participation and right to withdraw, formed part of all research instruments, and were repeated at the beginning of each interview for each participant. Covid-19 protocols were observed during the process of data collection. Therefore, all participants shall remain anonymous, and their identities shall be protected by indicating their responses using numbers as the codes.

## **Findings**

The findings are presented according to the two objectives that guided the study and the direct quotes are stated as evidence to support the data.

## **1. Determining the type of vocational skills used by ex-offenders after their release from custody**

The first objective intended to establish the types of vocational skills used by ex-offenders after their release from custody. Three content areas that emanated from the data were: vocational trades/courses offered to the inmates, knowledge and skills acquired, and the evaluation of performance. The facilitators were drawn from the trades of carpentry, plumbing, electrical wiremen, and motor mechanics.

### ***Vocational trades/courses offered***

For the courses that are offered to the inmates, the facilitators reported that the trades offered to the inmates are: agriculture, auto electrical, building construction, leather crafting, electrical wiremen, carpentry, motor mechanics, metal works, panel beating, plumbing, spray painting, pottery, and upholstery. This was supported by ex-offenders who said: “I acquired engineering skills” and another stated “I did carpentry and joinery, cabinet making and wood machinist skills”. The ex-offenders reported to have gained the knowledge and skills from the trades that were provide to them while still in custody.

### ***Knowledge and skills acquisition***

The ex-offenders reported that they acquired various skills based on their interest and their experience. This is what they said:

When I got incarcerated, I was equipped with electrical installation skills. But then I changed after some time as I got interested with the refrigeration and air-conditioning trade which I enrolled for; I was selected based on that I have been equipped with electrical installation skills before (Ex-offender 03)

Another one stated,

I was selected because of my willingness to do carpentry, also based on my educational background as reading and writing were essential abilities in vocational training. In carpentry for example, one must understand measurements, how to read a tape measure and so on (Ex-offender 05)

Ex-offender 01 said, “I was selected to do upholstery because I could read and write, and I liked it because I thought I could use the skills to earn a living upon my release from custody.” The responses from the ex-offenders were confirmed by what the facilitators reported because one of them indicated that:

One major requirement is that the inmates must be able to read and write, with Grade 7 Certificate. Then they apply to enroll for the trades or courses of interest. In case the inmates did not attend school, they are encouraged to attend to basic literacy classes offered by another institute but here at the center. Also, experience in a specific trade is considered for selection of inmates to study the similar or relevant course (Facilitator 04).

The above quotes show that the trades offered seemed to be learner-centered in that the inmates were selected based on their interest, which could raise their motivation to learn and improve their performance. Although the ex-offenders had acquired knowledge of the skills they had preferred to, some indicated that they coped while others stated that they coped with difficulty. This is what the challenged ex-offender revealed:

I was faced with difficulty of reading and understanding jargon that was written in English. In leather crafting sometimes facilitators used catalogues for learning and some words were difficult for me to read and understand as my educational level is Grade 7. However, the facilitators and some of my colleagues used to assist me where I faced challenges (Ex-offender 02).

On a contrary, Ex-offender 04 said: “I was able to cope because there was a lot of practical work that was done that did not require a lot of writing, I mastered the skills with ease.” This shows that the level of education could have been a factor in enabling the inmates to easily understand the trade skills and thereby boosting their performance.

### ***Evaluation of performance***

The vocational skills were evaluated to see how the inmates were performing in terms of mastering the skills. This is what ex-offender 03 said:

Facilitators used to give us theory tests every Wednesday. Again, every month end we were given tasks to complete without any supervision. The tasks were allocated three days to be completed following the instructions written on a paper. Following completion of the task, each one would be graded according to the quality of what has been produced.

In agreement, Ex-offender 06 had this to say:

If the facilitator sees that one had now mastered the vocational skills, he would be selected to work in places such as the Royal Palace. Additionally, the public would bring their assets to be repaired such as wardrobes, or even place orders for the manufacturing of different products such as coffee tables, wooden tables and chairs and other things.

The above quotations from the ex-offenders were corroborated by their facilitators who reported that:

In assessing the mastery of the skills, tests are administered to each inmate to determine their level of understanding and retention. The practical aspect is assessed by assigning each inmate a job to do without close supervision. After they complete the job, facilitators measure the level of mastery of skills by assessing the quality of the product (Facilitator 09).

It can be noted that continuous assessment using weekly tests and developing the products was used to evaluate the level of the inmates’ performance and thereby ensuring their readiness for the world of work upon their release from custody.

## **2. Finding out how ex-offenders have used their vocational skills after their release from custody**

For the second objective, the researcher intended to determine if ex-offenders were able to apply the acquired vocational skills, and whether they were meeting the market demand or even improving their livelihoods.

Ex-offender 11 stated:

I have used my vocational skills at my workplace and when I get the piece jobs provided by my facilitators, also from the community members where I stay.

However, I was not so confident because when I first arrived at the company where I work, their design technology of sofas was completely different from what I learnt at the correctional center, hence, I struggled to adjust. But with time, I ended up learning those new skills.

The use of technology is important in the field of TVET since everything has changed, therefore the syllabus must change too. Another ex-offender said:

I have not secured any employment since my release from custody...The people in my community are too judgmental as some utter detrimental words just to make your living in the community miserable. The other thing is that the working tools are expensive, I need a special grinder and sewing machines for leather crafting to start my business (Ex-offender 06)

Ex-offender 11 reiterated that: “Changes in technology causes us to keep consulting with our facilitators and other colleagues before doing any jobs, yet that is bad practice which delays the completion of our work.” On a positive note, ex-offender 07 stated that he is doing fine by saying: “I have been hired by two different schools to maintain their refrigerators and air-conditioners. Members of my community have also given me several piece jobs and I did them with success. They seemed very happy with my work.”

The above quotes by ex-offender 11 implies that the curriculum used might be dated and not having the components of technology, which could be challenging in this 21<sup>st</sup> century skills where technology has become the basis for learning. The above was confirmed by the facilitators when indicating that the ex-offenders were able to use the acquired vocational skills. Facilitator 03 stated:

I do keep constant contact with the released offenders. I speak to their customers whom they have provided services to, just to find out how they have performed using their vocational skills. So far, I have received no complaints from their customers, meaning that the ex-offenders use their vocational skills accordingly, also to improve their lives (Facilitator 03)

Nonetheless, for some ex-offenders, lack of startup capital to buy working tools made them stay longer without using their vocational skills:

I have been released from custody ten months ago. I am unemployed because I am not prepared to work for someone as the upholstery trade pays a lot of money if you own a business... currently I am negotiating with my family to help me start my business, then I can take it from there (Ex-offender 08).

Ex-offender 12 echoed:

Lack of startup capital is my major challenge as I do not want to secure a paid employment but want to start my own business. Secondly, some individuals refuse to offer me piece jobs because they fear that I might steal from them, or I might take the deposit and disappear (Ex-offender 12).

The Facilitator 01 said:

Although the ex-offenders do get the necessary skills to thrive outside in the world of work, there is not much support from the communities and organizations which can increase opportunities for securing sustainable employment that pays reasonable income...and some relapse unemployable due to stigma that causes them to cause more crimes. Another challenge is the unavailability of funding for them to acquire

the needed equipment, tools, and machinery to start their own businesses (Facilitator 01).

It became obvious that some ex-offenders were determined to establish their own businesses than securing employment, which was a positive mindset, although they were challenged to get the startup capital.

## Discussion

The findings revealed that ex-offenders had acquired various trades such as leather crafting, upholstery, carpentry, and joinery which indicated that there is a wide range of vocational skills options offered to inmates while in custody. This finding is affirming what Mohammed and Mohammed (2015) exposed in Canada and Zoukis (2015) where inmates also partake in variety of trades to choose while kept in custody. It was discovered that ex-offenders were equipped with technical vocational skills and knowledge, which confirmed the findings by Nkwanyane et al., (2020) as offenders were enrolled in various trades based on their previous experience and their level of literacy. It was interesting to note that the choice is learner centered (Ngozwana, 2017) meaning that the trades served the interests of offenders in Eswatini. However, it was found that few of those ex-offenders could not easily cope, which could be because of their lower literacy levels, while other were found to cope as they used a lot of practical experience to learn the trades. The findings pointed that offenders performed well while assessed continuously to evaluate their level of producing quality products. This finding counter what Munishi and Emmanuel (2016) found in Tanzania where there is poor performance by TVET graduates.

It was found that some ex-offenders had used their vocational skills by securing employment in places related to the trades they acquired, meaning that their vocational skills could be used in relevant industries. This finding approves the finding by Lindeman (2017) in Australia where ex-offenders were able to secure employment and used their vocational skills to get the piece jobs from community members, friends, schools. However, it was established that for other ex-offenders their skills were partially relevant because they were challenged by technology. For instance, ex-offenders 11 reported to have felt less confident as he had to consult from time to time with the facilitators and his colleagues. This could imply the obsolete TVET curriculum that needs to be reviewed to infuse technology within Eswatini correctional centers. This is aligned to what Munishi and Emmanuel (2016) and Zarina et al. (2016) stated regarding the need to infuse technology in TVET curricula so as to keep up to date with the current market demand.

On the other hand, the technology challenge could mean the lack of work experience through internships and placement within different industries, to prepare offenders for the world of work. This disproves what the Correctional Wheel (2020) stipulated in Eswatini, meaning that what is written is not put to practice. Several studies have shown the importance of collaboration and partnerships (Raihan, 2014; Ngure, 2015) because such efforts could yield the relevance of TVET skills in meeting the market demands. It was further found that some of the ex-offenders could not use their vocational skills due to lack of funding to establish their own businesses by buying the necessary equipment, while others encountered issues of stigma. This implies that rehabilitation and reintegration of offenders using TVET skills needed to be strengthened, which support assertions by Vandala (2019).

## Conclusion

Based on the findings from this study, it can be concluded that several vocational skills such as leather crafting, upholstery, carpentry, and others were used by ex-offenders after their release from custody. It can further be concluded that the ex-offenders used their vocational skills by securing paid employment and by getting piece jobs, thus making their skill relevant in that way. However, the study established a disconnection between what was offered and what the world of employment wants in terms of the lack of relevance to the current technology by some ex-offenders and the industry practice. This means that the TVET skills acquired by the ex-offenders in Eswatini could partially meet the market demands especially during the globally competitive world of the twenty-first century. The following suggestions are recommended to the policy guiding the correctional centers in Eswatini:

1. Hold regular awareness campaigns about re-integration of offenders to their communities to reduce the stigma attached to offending.
2. Establish and strengthened partnerships between private sector industries where ex-offenders could easily be employed or even secure the equipment to start up their businesses after their release from custody.
3. Correctional centers to develop and review their current TVET curricula and make it responsive to the needs of its learners and the industries. This is to ensure for the relevance of the skills acquired that can appropriately be used the economic growth of their country.

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## ***Working With Robots: Design and Evaluation of an Introductory Computer Science Teaching Unit With Educational Robots***

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### **Abstract**

As our world continues to digitalize more and more, Computer Science concepts have started to interweave with our daily life. Accordingly, teaching these concepts in schools is becoming increasingly relevant. An illustrative and practical way to do this is by using haptic examples of these very same concepts in form of educational robots. This offers the benefit of motivating and playful access to the field for young students. However, to integrate the robots productively into Computer Science lessons, engaging teaching units are essential. To support the design of those teaching units, we surveyed students and teachers to evaluate their preferences regarding the use of robots in Computer Science lessons. The survey had 95 participants, 6 teachers, and 86 students, from 6 different classes of 4 different schools. Using the results of this survey, we further designed, conducted, and evaluated a teaching sequence for a German 6<sup>th</sup>-grade Computer Science course. As a robot, we used the educational kit LEGO MINDSTORMS (Model 51515) alongside Apple iPads. The course consisted of 30 students, 15 of them male and 15 female, aged between 11 and 13. During the sequence, we observed the students' motivation and their progress in learning computer programming concepts. We also examined the results of their exercises. We found that the robots positively impacted the students' motivation and learning process. In this paper, we present both the survey and the teaching unit, as well as their respective results.

Keywords: Educational Robotic, Computer Programming Education, New Technologies in Education

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## Introduction

The subject of Computer Science gains more and more importance in our ever-growing digital world. Schools have the task to prepare young people for a self-determined life in our society and a successful start into their professional lives. Without knowledge of the digital world and basic Computer Science concepts, this is not possible anymore nowadays.

Therefore, in the German federal state of North Rhine-Westphalia, Computer Science became a mandatory subject for the first time this year in 5<sup>th</sup> and/or 6<sup>th</sup> grade, with students of age 11 to 13 [1].

However, the mathematical and Computer Science concepts are often abstract and hard to comprehend for students at this age. Educational robots represent a tangible representation of these concepts and therefore a possible solution to approach this problem.

This brings us to the core of this paper: how can teaching units with educational robots for this age group be designed and how do they influence the performance and motivation of the students. To examine this, we have carried out the following steps, to design and evaluate a teaching unit with the educational robot LEGO MINDSTORMS:

1. A survey to determine the preferences of students as well as teachers for the use of robots in teaching units
2. The design of a teaching unit considering these results and the core curriculum for Computer Science in North Rhine-Westphalia
3. Carrying out this teaching unit in a German 6<sup>th</sup> grade class in North Rhine-Westphalia
4. An evaluation of the teaching unit using the students' results for their assignments during class and a survey conducted with the students of this class to determine their motivation during class

## Related Work

Activities with educational robots can serve learning objectives from a wide range of disciplines from technology and design to mathematics and science [4]. Barker et. al. suggest the use of robots in a variety of disciplines [5].

Zhong et. al. found in a recent survey based on 20 studies over the last 18 years that robots, in general, improve the learning progress of students in mathematics, more specifically regarding “graphics and geometry”, “number and algebra”, and “practice and synthesis application”. In the survey, they used robots, mainly LEGO robots, for “learning by interacting”, “learning by programming” and learning by “building and programming” [6].

Educational robots are also used to demonstrate principles of Computer Science. As shown by Magnenat et al. robots can be used in this field with great effect to teach the otherwise often abstract concept of event handling [7]. Therefore this effect of robots in computer programming classes is commonly tested. However, the results vary greatly considering the students' performances [8, 9]. In our previous work as well as studies by Çankaya et al. an increase in the students' motivation was detected [10, 11].

The students' motivation is strongly linked to their perception of the robot. The results of a survey performed by Serholt et al. show a generally positive response towards the robots as long as the robot is not able to grade the assignments [12]. Lakatos et al. on the other hand

found that the children's perception of the robot is influenced by the activities the children experience with the robot. They also found differences in the children's perceptions considering their gender [13].

One example of educational robots is the LEGO MINDSTORMS. As early as the late 1960s, the inventor of logo, Seymour Papert, was busy with how students can be interestingly taught programming [14]. In the mid-90s he developed software that made it possible to move Lego bricks [15]. In cooperation with the Danish Toymaker LEGO, he first introduced a programmable robot in 1998. This was called LEGO MINDSTORMS Version RCX. In 2006, the MINDSTORMS NXT was presented, and replaced in 2013 by the EV3. Finally, in 2020, LEGO Mindstorms Robot Inventor (model 51515) became the new model. At the time of this work, this is the latest model published, which is also used for our teaching unit [16].

### **Preferences toward the design of Computer Science lessons from students and teachers**

To determine the preferences of students and teachers for a teaching unit with robots we carried out an online survey with Qualtrics [17].

We used two separate surveys: one for teachers and one for students. In both surveys, we started with questions about the participants. For the students, we asked about their school, age, grade, and gender. For the teachers, we asked about their age, gender, and for how many years they have been teaching.

Afterward, the students had four blocks with questions for different topics. We asked the students first how much they are interested in the subject. The answers were given on a five-scaled Likert scale (very much, much, neutral, little, very little). This question was followed by a couple of free text questions. First, we asked what the students were thinking about when hearing the term Computer Science. Afterward, we asked what they were most interested in regarding the subject, followed by the question of what the students thought about when thinking about robots. Next, we asked if they had ever worked with robots in class before.

Following this first block of questions, we asked questions about the students' self-assessment for their performance in class. We started with the question of how difficult the subject was for the student. We again used a five-scaled Likert scale (very easy, easy, neither easy nor hard, hard, very hard). A similar Likert scale was used to have the students assess their performances and how often they participated actively in the lessons. Afterward, we wanted the students to assess how the other students and the teacher assessed their performances and how the student thinks their performance might change in the future. For all these questions we used five-scaled Likert scales.

For the next block, the questions varied depending on if the participant has worked with robots in class before. For the students who had worked with robots we asked as a free text question with which robot they had experience. This question was followed by three Likert scales questions about the learning process with the robot. First, if they liked working with the robot, followed by if working with the robot helped them to understand the topics of the lessons, and finally if they wanted to work with a robot more often in lessons. For the students who had not worked with a robot before we just asked one question: how much they would like to work with a robot during lessons. We again used a five-scaled Likert scale.

In the last question block, we wanted the students to give feedback on their current Computer Science lessons. First, the students rated their lessons on a five-scaled Likert scale from very good, to very bad. Afterward, they were given four free text questions, starting with what they liked and disliked about their lessons, followed by their wishes for future lessons, and finally which topics they had covered in the subject so far.

The survey for the teachers was slightly different. Here we had three blocks of questions, starting with their self-assessment for their lessons. First were two Likert scales, where we wanted to know how the teachers assess the difficulty during their lessons and rate the student's motivation during the lessons. These questions were followed by two free text questions, first asking about the differences between different topics in teaching Computer Science and if they noticed a difference between the students' genders. In both cases, we asked them to explain their answers. As the last question in this block, we asked if they used robots or simulations of robots in their lessons before.

The next block of questions diffracted again depending on if they used robots or simulations. If they had used robots or simulations before, we asked which ones they had used. Afterward, we used the Likert scales and asked them to rate the use of the robot or simulation first for understanding the topic and second for the students' motivation.

For the teachers who had not worked with robots or simulations before, we asked why they hadn't used them and if they want to try in the future.

In the last question block, we asked the teachers what advantages and disadvantages they saw by using robots in class and which special factor of their current teaching was particularly positive or negative. All of these questions had free-text answers.

86 students, from 6 different classes of 4 different schools participated in this survey. The student's age was between 14 and 18 years. 67% of our participants were male and 26% were female. The remaining students choose not to specify their gender. Most of our participants (43%) were interested in the subject of Computer Science. Another 20% were very interested and 24% had neutral feelings towards the subject. 6% stated to be less interested in the subject or not interested at all.

A clear majority (~60%) of the students first thought about programming when thinking about Computer Science, some other noteworthy answers were logic, IT, and hardware components. Programming was also with ~38% the topic that was most interesting for our participants, followed by logic with ~21%.

The students answered that they liked the topics (namely programming, theories behind computer programming, and logical problems) with ~36% and the lesson designs (e.g. working in group, high topic variety) with ~30% most about their class. The answers regarding what the students did not like about their lessons diffracted a lot more. While ~15% stated that the lessons were too hard ~8% stated they were too easy. Considering their performances most students stated in all assessment questions to be either good or very good in the subject. Surprisingly, a lot more students stated to be very good in the self-assessment than in the other assessment questions.

Some students wanted to program more, others less. There was no clear majority in the answers to that question. In the future, most students (~22%) wanted to work more freely and practically. 46% answered that they would really like to work with robots.

When thinking about robots most students (~57%) named technical components, while ~18% named the tasks robots were used for. Other answers to this question were examples of robots both real and from science fiction. 26% of our participants had worked with robots in their class before. For the robots the students worked with, they named the following: Calliope, LEGO MINDSTORMS, Magic Jinn, and Cozmo.

Regarding the influence of the robot on their performances the students were indecisive. Most students (52%) answered that the robot would help to understand the topics ‘a little’ better. However, a clear majority (81%) of the students thought that the robot helped their motivation.

In the teacher’s survey, we had 6 participants. Three participants were male, two female, and one decided not to answer the question about their gender. The teacher’s age varied between 34 and 60 years. The least experienced teacher was teaching for half a year and the most experienced taught the subject for 15 years. Most of the teachers (50%) assessed their lessons to be ‘easy’, the others thought their lessons were either ‘hard’ or ‘neither easy nor hard’. All teachers thought their students to be either ‘motivated’ or ‘very motivated’ in the lesson. All teachers named a couple of differences in the students’ motivation depending on the topic of the lesson but there were no clear trends in their answers. All teachers agreed that motivation does not differ between the students’ genders.

66% of the teachers had used robots or simulations of them in their lessons. They named Calibot and Robot Karol and stated to mainly use them in grades 5 to 9. All of them saw a positive impact from using these devices in both the performance and motivation of the students. The teachers who have not used robots or robot simulations in their classes did not teach the grades to do so or had not enough devices at their school. All of them would use robots if they had the opportunity. As positive aspects of using robots, the participants named the visibility of the programs, higher motivation from the students, and the haptic aspect. As negative aspects, the teachers named the lack of ideas to use robots for older students and the high time and organization costs.

### **Constraints of the teaching unit**

The teaching sequence was carried out in a 6<sup>th</sup> grade at a German secondary school in North Rhine-Westphalia. The course started with the subject of Computer Science about half a year before this teaching unit started. The students had little to no experience with computer programming. There are 30 students in the class, 15 of them male and 15 female. The age varies between 11 and 13.

The lessons were held from 14:20 till 15:50 and were mandatory for all students. For the lessons, the students got Apple iPads for usage in class. These tablets had neither a pen nor a keyboard. The students were not allowed to take these devices home or use them for anything but the lessons. All results were saved in the school’s cloud. The robot model was the LEGO MINDSTORMS model 51515 “Tricky” (Fig. 3). As the programming tool, we used the corresponding LEGO MINDSTORMS EV3 HOME app. This app works with programming blocks similar to Scratch (Fig. 4).

The students used the robots in small groups of two or three. The usage of the robot was also limited to the lessons and the students could not take the robot home.

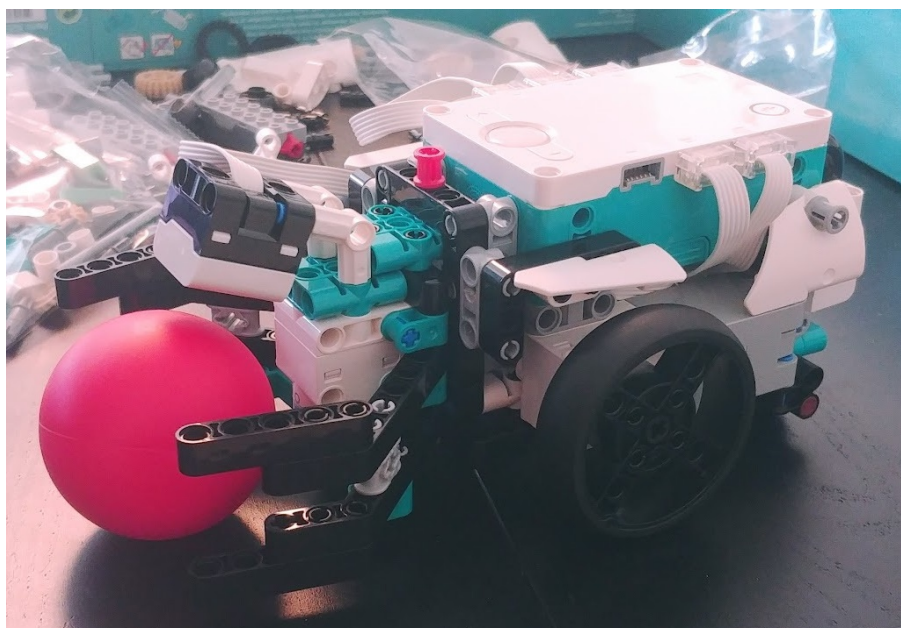


Figure 1: LEGO MINDSTORMS 51515 "Tricky".

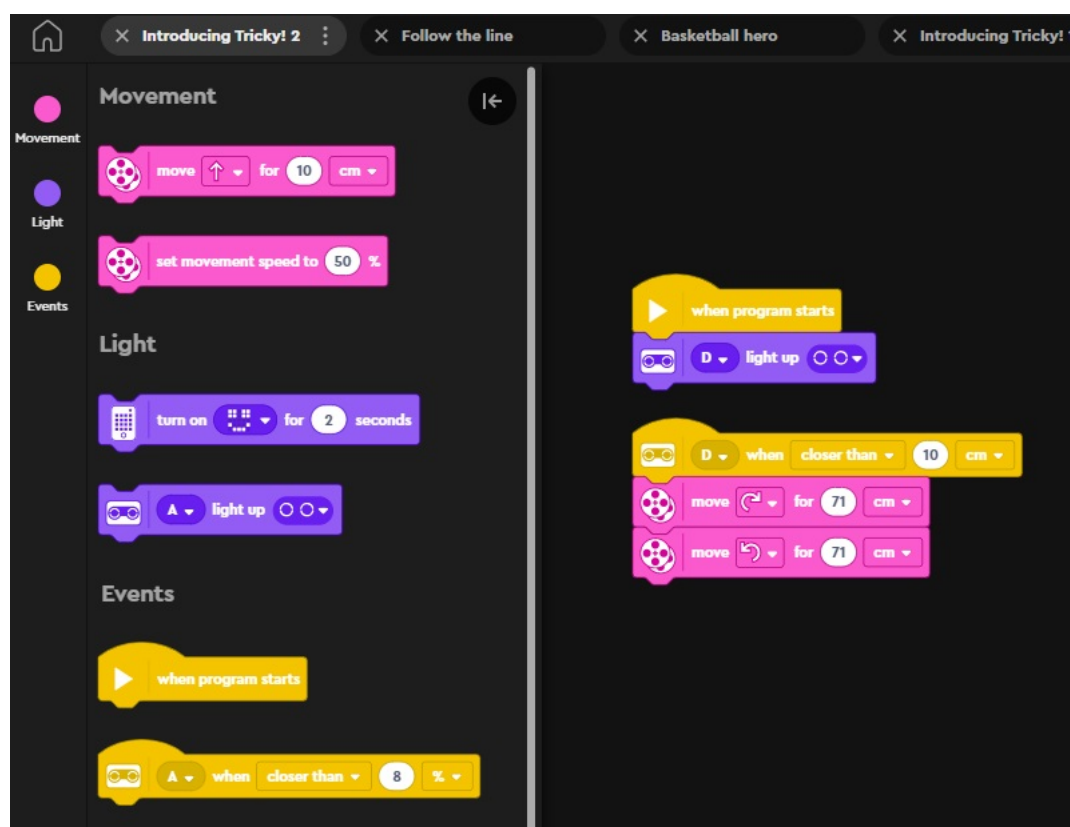


Figure 2: LEGO MINDSTORMS EV3 HOME App.

### The teaching unit: design considerations and execution plan

We designed the teaching unit according to the core curriculum from the German federal state of North Rhine-Westphalia for 5<sup>th</sup> and 6<sup>th</sup> Grade and the results of our online survey considering the preferred teaching methods of the students. According to the curriculum, we choose the competency-based goals for each lesson. The complete plan for the teaching unit, each row representing one 90-minute lesson, is shown in the following table:



<b>Lesson topic</b>	<b>Competency-based lesson goals</b> The students ...
The robot as a programming tool: getting started with LEGO MINDSTORMS	... recognize the robot as a use case for executing an algorithm and recognize its benefit and limits
First implementation with LEGO MINDSTORMS: movements, sound effects, and light	... design rules of acting for the wanted robot behavior and display them in a program schedule plan
LEGO MINDSTORMS movements in different shapes using counter loops	... identify the counter loop within given rules of acting, display them in a program schedule plan, and transfer them into code
Using branches to control supersonic and touch sensors	... identify the counter loop within given rules of acting, display them in a program schedule plan, and transfer them into code  ... name use cases for sensors in their everyday life
Autonomous vehicles: first steps to program a parking assistant for the LEGO MINDSTORMS	... describe the everyday use case of a parking assistant and transfer it to rules of acting for the LEGO MINDSTORMS
Programming a parking assistant using loops with conditions	... program a parking assistant for the LEGO MINDSTORMS using a loop with conditions
Update the parking assistant by using linked conditions and measurements for the supersonic sensor	... interpret the supersonic sensors' return values in context and use them within their program
Comparing the LEGO MINDSTORMS parking assistant with the real-life example of autonomous vehicles	... describe the technical ideas behind an autonomous vehicle
Evaluating the consequences of autonomous vehicles	... describe and discuss the consequences of using autonomous vehicles in our everyday lives.

Table 1: Planned lessons.

The teaching unit includes the subject areas 'algorithms', 'automaton', and 'artificial intelligence', as well as 'Computer Science, humans, and society'.

It starts with an introduction to the LEGO MINDSTORMS and corresponding programs. Gradually, more and more program blocks are introduced and used by the students. Additionally, the students learn about motors and sensors both for the LEGO robot and in their everyday lives. The unit concludes with a project to program a parking assistant for the robot inspired by a real parking assistant.

## Challenges during the teaching unit

During the teaching unit, some challenges emerged. The first challenge we had to face was dealing with technical problems and updates. In our first lesson, all robots needed a software update, even though we updated the robots a day before this lesson. Therefore, a lot of time was lost, as we had to update the robots one by one, given that the robots can only update while connected to a power source and the iPads don't have a USBport. After this, we invested in a mobile charging station for the robots. This solved the problem of updating the robots one by one, but the updates still appeared regularly during lessons.

Other technical inconveniences were the motors and sensors of the robots. In the chosen construction the robot uses 3 motors, two for the wheels and one for the clutch, and 2 sensors, a supersonic sensor, and a color sensor, all of which were used during the teaching unit. From time to time some of these did not work which led to high frustration with the students and a lot of additional work for the teachers. All these technical problems could only be solved by teaching with multiple teachers, so one of them could focus on the technical problems, while the other focused on the actual teaching. However, most German schools don't have the resources to do this.

Another major issue was classroom management. We figured out quickly that an average classroom was not big enough for our teaching unit. From previous experiences, we learned that robots fall and break a lot. Therefore a lot of time during the lessons was needed to rebuild and repair the robots. We hence decided to use the floor for every programming exercise for this teaching unit. But at the same time, we still needed tables for the students to make notes and pay attention to the blackboard during instructions. Therefore we choose a bigger room (in our case a chemistry room but an auditorium or a gym would work fine, too) where we could use little table groups paired with a 1 m<sup>2</sup> mat to work on the floor. We also used acoustic signals to change from the tables to the mat and the other way around. With this classroom management, we were able to keep an overview of the students and their work while also maintaining a comfortable noise level.

Another issue that is partly related to technical problems was the usability of the LEGO MINDSTORMS app. Although the app is designed for children, it was overwhelming for the students at first, providing a lot of different use cases and functions. Most of these problems were solved as the students got accustomed to the app. However, there were still a lot of programming blocks to choose from and the students had difficulties deciding on the best ones, as well as distinguishing them from each other. Hence we decided to limit the programming block by handing out a selection of blocks that were used for the tasks. New programming blocks were added to that handout when introduced during class. The students were not necessarily limited to that selection, but the programming blocks given on the handout were enough to solve the given tasks. This limitation especially helped the less performing students.

Lastly, it was not simple for the students to see the connection between theory and programming tasks. Some students who performed very well during theory did not perform as well in the programming exercises and vice versa. During both conversations in the small groups and the whole class, it became clear that the students often did not make the connection between the theoretical terms like loop and branch and the used programming blocks, even though they were specifically used while introducing each new programming block. After detecting this issue a task was given to the students where they had to sort the

programming blocks into the basic programming constructs. Although that task helped a lot of the students, some of them still had problems detecting the differences later on.

### **Survey at the end of the teaching unit**

During the last lesson of the teaching sequence, the students evaluated the unit in a paper survey. 25 of 30 students participated in this survey (13 male and 12 female). The survey was divided into four sections.

The first section focused on the students' interest in the teaching unit. First, we asked the participating students to rank the teaching unit by how interesting the lessons were. The answers were given on a five-scaled Likert scale ('very interesting', 'interesting', 'neutral', 'boring', and 'very boring'). Afterward, the same scale was used to determine how interesting the robots, the programming exercises, and the exercises with the program schedule plan were.

The second section focused on the difficulty of the teaching unit. For this section, we used a similar five-scaled Likert scale with the options 'very easy', 'easy', 'neither easy nor hard', 'hard', and 'very hard'. We asked about the difficulty in working with the robot in general, during the programming exercises and the exercises with the program schedule plan.

Afterward, the students were asked to state if they would like to work with the robot more often and if they liked the teaching unit. For these questions, they could choose from a three-scaled Likert scale with the options 'yes', 'no opinion', and 'no'.

All three first sections were chosen to get a general overview of the students' thoughts and feelings towards the robots and the teaching unit in general.

The third section contained four questions, starting with the children's opinion if they would like to program as much without a robot as with a robot. We also wanted them to substantiate their answers. Afterward, we asked two questions about reading the teaching lesson they just participated in and asked them what they particularly liked and disliked about that lesson. During this specific lesson, the students used most of the robot's functions. Therefore the students had a better access point to think about the particularities of the lessons, the robots and their preferences about them. In the last question, we asked the students to give advice and ideas for further improvements to the teaching sequence.

For the first questions considering the students' interests we found that most students had neutral feelings considering the teaching unit itself, both the exercises in programming and the program schedule plan, but were at least interested in working with the robot. The answers in the second section were all similar. Most students choose either 'easy' or 'neither easy nor hard' in all three questions.

In the third section, for the question if the students liked to work with the robots more often, 91% of the students' answers were split between 'yes' and 'no opinion'. Only 9% answered that they did not want to work with the robots again.

Correspondingly, most students choose 'no opinion' to answer the question if they liked the teaching unit. A lot more students choose 'yes' for this question than 'no'.

The majority of the students (58%) answered that they would not have as much fun during programming exercises without the robot, 9 students (36%) answered to at least have as much fun programming without the robot and 2 students (8%) were undecided. The most popular reason for preferring the robot was that the robot is more fun than programming without it. 4 students (16%) also explained that they preferred the robot because they could see the program executed right away using the robot. The reasons for programming without the robot were more varied. Some students stated that the robot was annoying, others just liked or were interested in computer programming in general and liked to explore working without the robot as well. 7 students (28%) did not give a reason for their answer at all.

Regarding the last robot lesson (Tab. 1), most students liked to work freely with the robot. For this exercise, the students were told to create a program of their choice using at least one of the robot's sensors. Using the sensors was another popular part of the lesson for a lot of students. The students also liked that they were allowed to work in their preferred groups. Individual students also stated that they liked the given tasks and their results. For the less popular parts of the lesson, 7 students (28%) named the update that had to be installed on the robot during that lesson. 3 students (12%) also complained about the waiting time and other technical problems as well. Only 3 students (12%) did not like the exercises. They explained that there were not enough exercises and 1 student (4%) did not understand the task at first. 9 students (36%) disliked nothing about the lesson, 2 (8%) disliked everything, and 2 students (8%) did not answer that question.

Regarding further improvements to the teaching unit a third of the students stated that it was either already good and did not need further improvements or that they did not know how to improve the lessons. 3 students (12%) suggested not learning at all and just playing games and 2 students (8%) did not answer this question. The other students had various ideas to further create variety during lessons. Some students wanted harder exercises and more time to freely explore the robot's functions during programming tasks. Others wanted to have more time off the display and plan lessons on their own. They also suggested integrating little challenges with the class for more motivation.

### **The students' performance during the programming exercises**

We also considered the students' handed-in results from their programming tasks. When the students worked in their dedicated groups during the lessons, they uploaded their results.

Overall the results were good. Most groups handed in correct solutions for most of the given tasks. More than half the groups also handed in some voluntary additional tasks.

Within the solutions, the students used the concepts of infinite loops, counter loops, loops with conditions, branches, and partly even parallel branches with conditions that were not discussed in class. They also used the supersonic and color sensors properly within their conditions.

However, the students usually did not explain their solutions but just handed in screenshots from their programs. Therefore, it is hard to determine from the solutions only if the students did understand their program code or the theoretical structures used in the algorithms. It is also unclear if the students worked as a team in their group or if some students just profited from the other's work. From observations in class, we know that some groups worked less communicative than others. When identified we spoke to the students and in one case

changed their group constellation. Also by examining the students' Computer Science folders we could confirm the tasks there to be complete and correct.

Due to organizational difficulties (there are no exams planned in the curriculum for Computer Science for the 6<sup>th</sup> graders) we couldn't test the students in a written or oral exam.

## **Conclusion**

In summary, we conducted a survey to determine students' and teachers' preferences for the use of robots during Computer Science lessons. Afterward, we designed and executed a teaching unit with robots for a 6<sup>th</sup> grade course in Germany. In the end, we evaluated this teaching unit and the benefits of using the robots by evaluating the students' performance during class and a survey about the students' thoughts.

During both surveys, we observed that robots increase the students' motivation in learning computer programming concepts. The results of the teachers' survey and the students' results during the teaching unit show indicators that the use of robots also increases the students' performance but considering the small number of participants there is further research necessary before jumping to conclusions.

The execution as well as the results of the survey at the end of the teaching unit, also show that the increased motivation fast decreases again when technical errors occur. Therefore, strategies to handle these errors are needed. An additional person in the classroom focusing on technical problems seemed to be a big advantage.

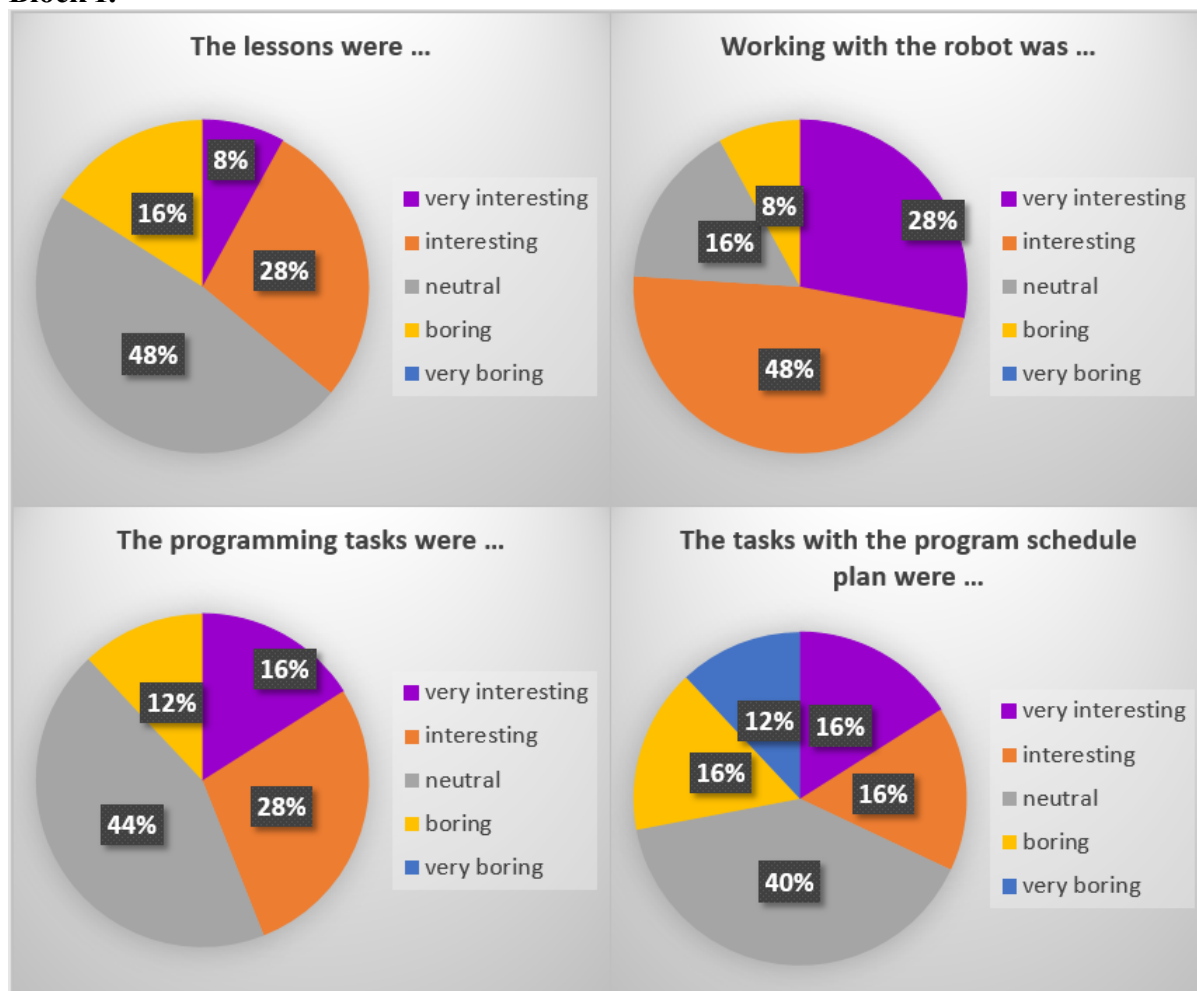
Working in small groups, especially in exercises where the students could explore their own ideas during computer programming was preferred by the students. Still, lesson phases where the students can connect theory and practical programming exercises are necessary to fully comprehend the computer programming ideas. For this phase, some students needed more time than originally planned for the teaching unit. In summary, the students need both periods where they can explore freely with the robot and phases to learn the ideas and connect these with their computer programming. More discussions with the whole class about specific program codes seemed very beneficial for the students to advance their codes.

In conclusion, robots do provide the hands-on approach to computer programming for younger students we hoped for. Even when considering the extra expenditure of time needed for the technical support and maintenance, the benefits for the learning process are worth keeping on and enhance teaching units with robots.

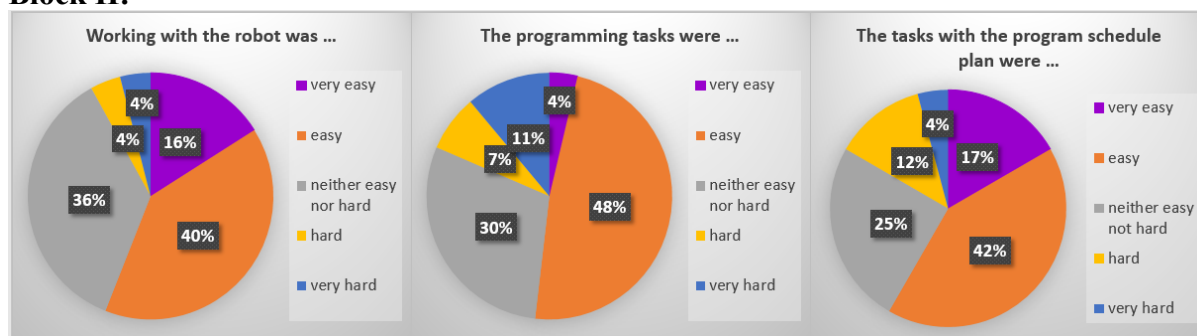
## Appendix

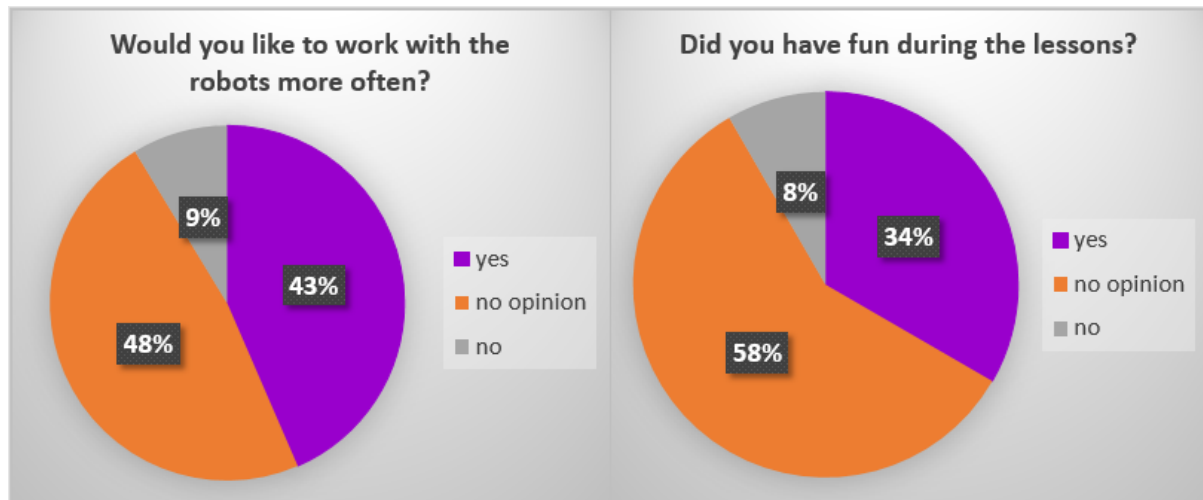
### 1. Results of student survey at the end of the teaching unit

#### Block I:



#### Block II:



**Block III:**

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***A Virtual Brief Psychosocial Intervention on Mental Wellbeing of Community College Students During the Pandemic: A Pilot Study***

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**Abstract**

Family, friends and peers are often seen as pillars of social support, especially in challenging times. However, during the pandemic where there are constant fear of infection, uncertainties, social isolation, and everyday disruptions, interactions with acquaintances and even strangers, even virtually and briefly, may help provide comfort and support. This study evaluated the ‘Inner Nurturing for Personal Growth Series’ of virtual psychosocial workshops aimed at improving mental wellbeing and decreasing feelings of uncertainty for students attending a community college. Facilitated by helping professionals, the workshops intended to create a sense of belonging and solidarity among participants while physically apart. The Self-Compassion Scale – Short Form, Intolerance of Uncertainty Scale, and the Short Warwick-Edinburgh Mental Well-being Scale were administered before and after each of the first three out of five workshops. 36 participants from different age groups (18-24yo, 25-34yo, 35-44yo, 55-64yo) completed both the pre- and post-tests. Repeated-measures t-tests were conducted on the sub-scale and total scores to determine changes in participants’ psychosocial wellbeing after workshop participation. The post-tests revealed a significant increase in participants’ self-kindness,  $t(35) = 2.273$  ( $p < .05$ ) and common humanity,  $t(35) = 2.132$  ( $p < .05$ ), and a significant decrease in prospective anxiety,  $t(35) = -2.123$  ( $p < .05$ ). The results provided preliminary recommendations on how time-limited, virtual psycho-social workshops may help students cope with pandemic-induced stress. To the authors’ knowledge, this was the first study to provide a statistical picture of the benefits of attending virtual brief psychosocial interventions among higher education students in Hong Kong.

**Keywords:** Socio-Emotional Learning, Virtual Brief Psychosocial Intervention, Weak Ties, Transferrable Psychological Resources, Mental Wellbeing, Higher Education Students

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## Introduction

The beginning of university life can be a challenging experience for most secondary school leavers (Morosanu, Handley, & O'Donovan, 2010; Clark, 2005), and this life stage has been identified as having the highest level of incidence in mental health illnesses (Ibrahim, Kelly, Adams, & Glazebrook, 2013). There is now decades of evidence demonstrating that the transition into higher education is often marked by academic, financial, social and developmental stressors that can negatively impact students' academic outcomes, confidence, belonging, wellbeing and mental health (e.g. Tinto, 2003; Kahu & Nelson, 2018; Fisher & Hood, 1987; Harris, 2019). As such, transition difficulties can lead frequently to academic under-performance and to withdrawal from university (Ishii *et al.*, 2018; Munro & Fisher, 2004; Machie, 2001).

While higher education students' mental health has been a growing concern even before the global COVID-19 outbreak, a growing number of studies have demonstrated the negative impact of the pandemic on this vulnerable population. A recent study found that during the pandemic, more than half of the students had experienced a higher level of anxiety (60.8%), feeling of loneliness (54.1%) and depression (59.8%) as they moved closer to graduating. A majority of students (60.9%) also found it hard to complete the semester at home (Lee, Solomon, Stead, Kwon and Ganti, 2021). Similarly, another study reported that more than 50% of students had experienced levels of anxiety and depression above the clinical cut offs, with females scoring significantly higher than males (Chen & Lucock, 2022).

The predictability of our lives is constantly disrupted in the times of COVID-19. Students have lost out on important elements of higher education such as in-class learning, internships, and graduation ceremonies (Aucejo, French, Araya & Zafar, 2020); social interactions (Son, Hegde, Smith, Wang & Sasangohar, 2020), peer support, and general normalcy (Sirrine, Klinier & Gollery, 2021). The worldwide measures of lockdown and social distancing have limited opportunities for normal socialising and establishing relationships for students, who have developed greater reliance on the use of social media, and possible chronic loneliness resulting from enforced preventive measures such as lockdowns, social distancing, self-isolation and quarantine (Shah, Nogueras, Woerden & Kiparoglou, 2020). For some, the pandemic has spurred an existential crisis that disrupts their identity and sense of meaning (Bogdanova & Rezvushkin, 2021).

Social belonging is fundamental to human beings (Baumeister & Leary, 1995), and it is widely documented that social support is associated with positive psychological and health outcomes. In higher education, there is a solid foundation of research indicating that social support plays an essential role in promoting students' academic achievement and mitigating emotional exhaustion (Li, Han, Wan, Sun & Cheng, 2018), facilitating self-efficacy (Lyrakos, 2012), adopting positive coping strategies (Mai, Wu & Huang, 2021), acting as a buffer against stressful events (Alsubaie, Stain, Webster & Wadman, 2019), and helping first year students deal with stressors associated with the challenge of transitioning to university (Urquhart & Pooley, 2007). Recent studies demonstrated that the benefits of social support for alleviating the effects of stress among university students also extend to the times of COVID-19, mitigating for the experience of stress (e.g., McLean, Gaul & Penco, 2022; Mai, Wu & Huang, 2021; Szkody, Stearns, Stanhope & McKinney, 2021).

While the need for social support to ensure the preparation and success of all students has never been more important in covid times, during the pandemic where in-person social

interactions are constantly limited by physical distancing, travel restrictions and lockdown, ordinary social support has become a luxury for many. Traditionally family and close friends are often regarded as pillars of social support, with the bulk of the existing evidence derived from research examining social relationships with close others (strong ties), such as family, romantic partners, and friends. Nevertheless, more recent research suggests that a wider range of interactions may contribute to fulfilling the fundamental human needs to belong and desire for connection, including those with acquaintances and even strangers (weak ties).

Weak tie relationships are typically characterised by those involving infrequent contact, low emotional intensity, and limited intimacy (Sandstrom & Dunn, 2014). Although there has been a paucity of research that examines the relationship between weak tie interactions and wellbeing, emerging findings suggest that in addition to strong ties, a wider range of relationships may contribute to fulfilling the social need to belong. For example, a greater sense of belonging and positive affect was reported by participants who simply interacted with a barista at a coffee shop (Sandstrom & Dunn, 2013), or when a passerby made eye contact instead of looking past them (Wesselmann, Cardoso, Slater, & Williams, 2012). For Sandstrom and Dunn (2014), weak ties were positively related to social and emotional wellbeing, in both university student and community samples. Nevertheless, the perception of strangers may vary depending on the location where the social encounter takes place. A recent qualitative study reported interesting findings that strangers are considered 'friendly' if they are met in semi-public spaces (e.g., a café or library) because of shared commonalities, and 'dangerous' if met in public spaces (e.g. streets), particularly at night (Zeeb & Joffe, 2020). In other words, the positive influence of interactions we have with our acquaintances, or even strangers, on our feelings of belonging and subjective wellbeing should not be underestimated.

During the pandemic, lockdown and social distancing measures have imposed digital platforms as the only means for communication, professional work, as well as for entertainment purposes in everyday life. In education, digital technology plays an important role whereby teaching is undertaken remotely, with students undergoing synchronous and asynchronous learning through digital platforms.

The rapid advancement of mobile internet technology and social media in recent years has led online communities to become one of the main channels for people to send requests for help and exchange views and opinions with others (Liu, Zhu & Xia, 2021). With the global societies under lockdown, digital technology therefore serves a vital role in maintaining virtual human interactions and socio-emotional connectedness (Kanekar & Sharma, 2020). A recent longitudinal study demonstrated that university students increased their use of digital tools for emotional regulation (e.g., to receive support from others) in times of social isolation and restricted movements during the pandemic (Tag *et al.*, 2022).

Based on the above, the purpose of the study was to explore the implementation and effectiveness of an online-based brief psychosocial intervention aimed at enhancing the level of student support service at a community college in Hong Kong during the pandemic. Recognising the loss of ordinary social support during the pandemic and the emerging benefits of weak tie interactions, the intervention was offered to the school-based network (students, staff, and alumni) as well as members of the wider community. The results of this study would be useful for administrators and staff, at both faculty and university levels, who have the interest to develop evidence-based virtual time-limited support services to improve the psychological wellbeing for their students, particularly in times of crises.

## The Intervention

Drawing upon ideas from humanistic and positive psychology that focus on discovering and nurturing human strength and life's positive qualities, purpose and meaning, the intervention, consisted of five online brief psychosocial workshops, were broadly connected by the umbrella theme of "*Inner Nurturing for Personal Growth*". The topics covered by the workshop series included smartphone addiction and health, sleep hygiene, resilience, personal growth, and self-compassion.

The goal of the workshop series was to raise awareness of mental wellbeing and self-care and promote a sense of solidarity and social connection to help build community identity and resilience during tough times. To achieve this, the workshops were led by community helping professionals experienced in delivering psychosocial interventions. By leveraging community resources to promote mental wellbeing, the series aimed to foster resilience and wellbeing within the school and the wider community through expanded support and meaningful school-community collaboration. The leverage also helped take some of the pressure off school counsellors, as well as frontline academic staff who often do not have sufficient training on supporting student mental health difficulties (Margrove, Gustowska & Grove, 2012) and whose mental health wellbeing needs at universities across the world has tended to be overlooked.

Each workshop lasted approximately 1.5 to 2 hours and was conducted online via the Zoom online conferencing tool. Participants were encouraged to reflect inward, connect to their inner selves, and improve overall emotional regulation using a combination of teaching, experiential activities, and reflective exercises. In addition to the zoom built-in chat box, polling and break out rooms, other online platforms such as Mentimeter and Kahoot! were used to encourage participant engagement and interactions.

The workshops were considered low-intensity intervention for mental health. Low-intensity interventions generally refer to cost effective, brief evidence-based psychological interventions for those experiencing from mild to moderate psychological issues. In other words, the workshops were not intended for those seeking intensive psychological support.

## Evaluation Purpose and Design

The virtual brief psychosocial intervention was an initiative designed to empower students through inner strength, agency, and community empowerment to deal with the change, stress and uncertainty during unprecedented challenging times. To evaluate the implementation and effectiveness of the intervention, the results addressed the following two evaluation questions:

1. Will the virtual brief psychosocial intervention lead to a statistically significant improvement in participants' mental wellbeing?
2. How the results can be transferred to similar or different interventions in the future aimed at enhancing student support in higher education?

## Scope

The intervention was organised by a community college in Hong Kong during the fifth wave of the COVID-19 outbreak, with the city implementing stringent social distancing restrictions to control the spread of the virus.

All workshops were free of charge offered to students, staff, alumni and the general public. Composite and individual posters were created to provide basic information about the series and workshops, and they were distributed through school e-mails and social media (e.g., WhatsApp, IG).

Workshop registration was done via a designated registration link or QR code. Upon successful registration, participants received a confirmation e-mail which provided details of the workshop including the Zoom link. For intervention evaluation, online pre- and post-intervention surveys were distributed to participants via e-mails.

## **Design**

### **Measures**

A Qualtrics pre-intervention evaluation survey was embedded in the confirmation e-mail which collected information about participants' demographics and their reasons for joining the workshops. The survey also asked participants to respond to a list of questions concerning their self-compassion, intolerance of uncertainty and mental wellbeing. These questions were also included in the post-intervention evaluation survey.

The three measures used for pre- and post-intervention evaluation were:

–Self-Compassion Scale–Short Form (SCS–SF; Raes, Pommier, Neff & Van Gucht, 2011): A 12-item (e.g., I try to see my failings as part of the human condition) self-report measure of capacity for self-compassion – the ability to hold one's feelings of suffering with a sense of kindness, connection, and concern. The 12 items are rated on a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always). The six subscales are self-kindness, self-judgement, common humanity, isolation, mindfulness and over-identified. Items of self-judgement, isolation and over-identified are negatively worded. A greater score in each subscale of the entire scale indicates a greater level of self-compassion.

–Intolerance of Uncertainty Scale (IUS-12; Carleton, Norton & Asmundson, 2007): A 12-item (e.g., Unforeseen events upset me greatly) self-report measure of responses to uncertainty, ambiguous situations, and the future. The 12 items are rated on a 5-point Likert scale ranging from 1 (not at all characteristic of me) to 5 (entirely characteristic of me) to evaluate two subscales of intolerance of uncertainty – prospective anxiety and inhibitory anxiety. A greater score in each subscale indicates a greater level of prospective anxiety and inhibitory anxiety.

–The Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS; Stewart-Brown, 2009): A 7-item (e.g., I've been feeling useful) self-report measure of mental wellbeing. The 7 items are rated on a 5-point Likert scale ranging from 1 (none of the time) to 5 (all of the time). A greater score indicates a higher level of mental wellbeing.

### **Data Analysis**

Statistical tests were conducted with the Statistical Package for Social Sciences (SPSS) version 26 software. The current intervention evaluation adopted repeated-measures t-tests to identify potential changes in participants' responses to the sub-scales and total scores of the measured variables, in order to determine whether their psychosocial wellbeing has improved after workshop participation.

## Ethical Considerations

Information about and an explanation of the ethical considerations of the intervention evaluation were provided to all participants, and they were asked to sign an informed consent when they agreed to participate in the evaluation.

Completion of the online pre- and post-intervention evaluation surveys was voluntary, anonymous, and confidential. Participants had the rights to skip questions that they did not feel comfortable answering. Participants were reassured that they were able to withdraw from the intervention evaluation at any time without any adverse consequences. Their right to take part in the workshops would not be affected.

To maintain data confidentiality, all participants were provided with a code, known only to the authors to ensure that their identity remain anonymous and confidential. All data collected in the surveys would be anonymous and coded. All data analyses were conducted at the group level.

## Conclusion: Results of the Intervention

### 1. Participant Characteristics

A total number of 227 participants attended the first 3 virtual psychosocial workshops of the 'Inner Nurturing for Personal Growth Series'. 88 participants completed the pre-workshop survey, and 56 participants completed the post-workshop survey.

Among the 36 participants who completed both the pre- and post-workshop surveys, 8 (22.2%) were men, 26 (72.2%) were women and 2 (5.6%) decided not to mention their gender. The participants came from different age groups, with a majority of 22 (61.1%) from 18-24 years, 6 (16.7%) from 25-34 years, 2 (5.6%) from 35-44 years, and 6 (16.7%) from 45-54 years. 25 (69.4%) of the participants were existing students at the community college, while others included alumni, external students, and individuals from the community.

For workshop promotion, 12 (33.3%) found out about the workshop via digital promotional materials (e.g., poster), while 8 (22.2%) through email, 8 (22.2%) through Facebook, and 8 (22.2%) through word of mouth.

For the reasons of registering for the workshop series, 30 (83.3%) wished 'to improve their knowledge and skills' related to the specific workshop, 25 (69.4%) wished 'to break out of their comfort zone and gain inspiration and new ideas', 13 (36.1%) wished 'to gain free professional advice', 13 (36.1%) indicated that they wanted 'to be able to cope with stress in general and related to current pandemic', and 12 (33.3%) wished 'to get a better understanding of myself and meet (virtually) people with similar interests and enthusiasm'. Table 1 shows the baseline characteristics of the participants.

### 2. Measured Variables

#### Self-compassion

After attending the workshop series, the participants reported statistically significant higher sub-scale scores in self-kindness ( $t(35) = 2.273, p = .029$ ) and common humanity ( $t(35) = 2.132, p = .040$ ), and the percentage increases were found to be 11.78% and 11.94%,



respectively. No statistically significant changes were observed in other subscales including self-judgement, isolation, mindfulness and over-identified, and the total self-compassion score.

Category	Characteristic	Total (N=36)	
		Count	Table Valid n %
Gender	Male	8	22.2%
	Female	26	72.2%
	Rather not say	2	5.6%
Age	18-24	22	61.1%
	25-34	6	16.7%
	35-44	2	5.6%
	45-54	6	16.7%
Role	HKMU Student	25	69.4%
	HKMU Alumni	1	2.8%
	External Student (University)	1	2.8%
	Other	9	25.0%
How did you find out about the workshop?	Email	8	22.2%
	Facebook	8	22.2%
	Digital promotional materials e.g. Poster	12	33.3%
	Word of mouth	8	22.2%
Why do you register for this workshop? (More than one option is allowed)	To improve my knowledge and skills related to this workshop	30	83.3%
	To break out of my comfort zone and gain inspiration and new ideas	25	69.4%
	To gain free professional advice	13	36.1%
	To be able to cope with stress in general and related to current pandemic	13	36.1%
	To get a better understanding of myself and meet (virtually) people with similar interests and enthusiasm	12	33.3%

Table 1: Baseline Characteristics of the Participants

Measured Variable	Pre-survey Mean (SD)	Post-survey Mean (SD)	Mean Difference (SD)	Percentage Change	<i>t</i>	<i>df</i>	<i>p</i> -value
Self-compassion	3.02 (.50)	3.15 (.34)	-0.13 (.51)	-4.30%	-1.560	35	.128
Self-Kindness	6.11 (1.49)	6.8 (1.66)	0.72 (1.91)	11.78%	2.273	35	.029*
Self-Judgement	5.56 (1.68)	6.02 (1.68)	0.47 (2.44)	0.08%	1.160	35	.254
Common Humanity	5.78 (1.94)	6.47 (1.90)	0.69 (1.95)	11.94%	2.132	35	.040*
Isolation	5.94 (1.66)	5.78 (2.02)	-0.17 (2.13)	-2.86%	-0.469	35	.642
Mindfulness	6.75 (1.38)	6.8 (1.82)	0.14 (2.00)	2.07%	0.416	35	.680
Over-identified	6.81 (1.82)	7.02 (1.75)	0.22 (2.02)	3.23%	0.661	35	.513
Prospective anxiety	23.92 (4.24)	22.42 (4.61)	-1.50 (4.24)	-6.27%	-2.123	35	.041*
Inhibitory Anxiety	13.81 (4.10)	13.9 (4.11)	0.17 (3.15)	1.23%	0.318	35	.753
Mental Well-being	22.14 (5.81)	21.42 (5.85)	-0.72 (4.17)	3.25%	-1.040	35	.305

\*  $p < .05$ 

Table 2: Summary of the Results of the Repeated-Measures T-tests on Measured Variables

## **Intolerance of uncertainty**

After attending the workshop series, participants reported statistically significant lower sub-scale scores in prospective anxiety ( $t(35) = -2.123, p = .041$ ) with a percentage decrease of 6.27%. However, no statistically significant change was observed in their inhibitory anxiety.

## **Mental Wellbeing**

There was no statistically significant change observed in participants' overall mental wellbeing when comparing their responses in the pre- and post-intervention evaluation surveys.

Table 2 summarised the results of the repeated-measures t-tests performed to review the potential improvements in participants' psychological wellbeing after attending the workshop series.

## **Conclusion: Evaluation of the Intervention**

To the authors' knowledge, this was the first study to provide a statistical picture of the benefits of attending virtual brief psychosocial interventions among higher education students in Hong Kong. More importantly, the study provided preliminary evidence of how the workshop series met its goals and objectives of improving participants' psychological wellbeing during the COVID-19 pandemic. Three key themes of the intervention implementation were identified as follows:

### **Theme 1: Coping with COVID-related stressors with self-compassion**

Our findings showed that the intervention was effective in improving certain components of self-compassion among the participants. In particular, the increase in self-kindness may reflect the intervention's success in promoting participants' awareness and acceptance of the "problems" they experienced during the pandemic, especially loneliness and its associated anxiety and depression. The strengthened sense of common humanity could be a result of the semi-public encounters provided by the virtual workshops, where participants from weak tie relationships shared similar reasons and purposes of joining the events.

The observed positive psychological changes served as evidence of the assumption that self-compassion is trainable (Kirby, Tellegen & Steindl, 2017). Intervention strategies such as Compassionate Mind Training (CMT; Gilbert, 2009), the Mindfulness-Based Stress Reduction programme (Kabat-Zinn, 1991; Shapiro *et al.* 2007) and the Mindful Self-Compassion programme (Neff, 2011) are commonly recommended to promote individuals' self-compassion. However, our findings suggested that instead of providing intensive, well-designed and structured training programmes, self-compassion can also be cultivated in virtual brief school-based interventions. Moving the traditional face-to-face intervention online therefore may offer a promising alternative cost-effective measure to provide school-wide support to students in higher education settings.

## **Theme 2: Welcoming uncertainty related to future events**

Another significant reduction observed was in participants' prospective anxiety which may reflect their increased readiness and preparation to cope with threats associated with future events. This sense of preparedness may shield participants from the feelings of anxiety and worry towards threats associated with the COVID-19 (Zhang & Fan, 2022), shifting the possible existential crisis to spiritual and existential growth, such as having greater clarity about life's meaning and a greater sense of harmony with the world (Tedeschi, Cann, Taku, Ssenol-Durak & Caolhourn, 2017).

When asked about the reason(s) of registering for the workshops, over 80% of the participants selected "To improve my knowledge and skills related to this workshop", indicating a strong need of equipping oneself to handle existing or future problems. Our findings may indicate the intervention's success in fulfilling this wish, i.e., a significant need of information, and hence resulted in the participants' stronger sense of self-agency. In other words, after attending the workshops, participants may feel more in control of their life during difficult times. It may also suggest that for these participants, direct counselling or psychotherapies is not always necessary. Our intervention which focuses more on psychoeducation could already be a source of timely, targeted and sufficient support.

## **Theme 3: Cultivating transferral psychological resources for the post-pandemic era**

Both self-compassion and prospective anxiety were found to be significant predictors of one's life satisfaction in times of COVID-19 (Maftai & Lăzărescu, 2022). However, it is believed that these facets not only protect individuals from the psychological disequilibrium brought by social, economic and personal disruptions during the pandemic, or help them adapt to the post-pandemic "new normal", but also help them face similar challenges in other life transitions, such as education and career transitions, especially in scenarios where important decision-making is required (Terry, Leary & Mehta, 2013; Kroshus, Hawrilenko & Browning, 2021). These psychological resources are transferrable and would help individuals remain hopeful in face of various transition difficulties in life.

Most importantly, our findings reflected that low-intensity interventions could be a type favourable practice to overcome cultural barriers associated with the provision of psychosocial support, especially mental health stigma and face concerns among the Chinese communities (Chen, Mak & Lam, 2020). The strength-based (as opposed to problem-oriented) approach helps to normalise help-seeking behaviour and reduce the stigma associated with mental health problems in university settings. More importantly, the virtual intervention format allows participants to hide their identities (Yurayat & Seechaliao, 2021), helping students with social concerns to "save face", which in turn may result in increased readiness to seek help.

## **Limitations and Future Work**

The current study had several limitations. First, the small sample size of participants who completed both pre- and post-workshop surveys may affect the generalisability of the evaluation result to the entire group of attendees. Second, qualitative evaluation that reveal how particular intervention components and process may cultivate intrapersonal and interpersonal competencies among the participants is lacking. Third, the longitudinal effects

of the intervention were not examined. Future exploration may address these limitations to provide a more comprehensive evaluation of the intervention.

## Intervention Recommendations

The results of this intervention evaluation provides the following recommendations on student support and socioemotional learning in higher education settings:

<b>Accessibility</b>
<ul style="list-style-type: none"> <li>· Recognising the important role of mental health in students' academic performance and providing opportunities that normalise help-seeking behaviour</li> <li>· Balancing the intensity of interventions and the degree and mode of facilitation based on the population size and level of needs of targeted participants to increase student support services accessibility</li> </ul>
<b>Flexibility</b>
<ul style="list-style-type: none"> <li>· Using digital connection as sources of social connectedness and social support from a wider network of individuals (Long <i>et al.</i>, 2022)</li> <li>· Shifting face-to-face encounters to hybrid or purely online sessions depending on health and financial considerations and related restrictions</li> </ul>
<b>Creativity</b>
<ul style="list-style-type: none"> <li>· Rethinking the format of psychological intervention using digital connection</li> <li>· Exploring new contact means such as text-based communication that does not require synchronicity, participants to be simultaneously available (Kluck, Stoyanova &amp; Krämer, 2021)</li> </ul>
<b>Weak Ties</b>
<ul style="list-style-type: none"> <li>· Promoting personal growth through meaningful interactions with peers, acquaintances and strangers</li> <li>· Creating opportunities of participating in semi-public encounters where participants can enjoy self-expression in a distant yet secure and trustable relationships</li> </ul>
<b>Community Solidarity &amp; Humanity</b>
<ul style="list-style-type: none"> <li>· Preserving strong and sustainable community networks in face of physical isolation</li> <li>· Incorporating a systems approach which promotes a sense of membership in schools and the community (Long <i>et al.</i>, 2022)</li> </ul>
<b>Humanistic/Positive Psychology</b>
<ul style="list-style-type: none"> <li>· Providing a positive and empowering environment by conceptualising students' needs from a humanistic/ positive psychology perspective which stresses the nurturance of inner resources (e.g., identity, savouring, strengths, forgiveness, the meaning of life), instead of adopting a problem-solving perspective in student development</li> </ul>

- Re-thinking, re-designing and re-shaping teaching pedagogies by integrating specific evidence-based low-intensity intervention strategies to take students' holistic and life-long development (i.e., education and career transitions) into consideration in regular teaching and learning

#### **Cultural Responsiveness**

- Addressing the potential stigmatisation (i.e., cognitive and motivational biases) towards mental health problems and cultural face concerns when providing psychological interventions in Chinese communities
- Respecting anonymity and protecting the right of participants to hide their identity during the intervention process to promote feelings of safety and autonomy

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## ***A Survey About the Use of Educational Robots and Physical Computing Devices in Computer Science Lessons at German Secondary Schools***

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Official Conference Proceedings

### **Abstract**

Educational robots and physical computing devices are steadily becoming a common sight in computer science classes, as they offer both motivating and illustrative access to a multitude of technical concepts. However, this versatility comes with the drawback that it is not a priori clear how such systems should be designed or how they are most effectively used during lessons. It's also unclear how much additional workload their maintenance incorporates. To help answer these questions, we conducted a survey at 114 German secondary schools from 11 different federal states. First, we asked computer science teachers about the current state of their lessons and the additional workload regarding the maintenance of the technical devices at their school. Afterward, we questioned our participants about how educational robots and physical computing devices are used in their respective classes, what positive and negative aspects they see in such systems and how much additional workload they add. We found that in 49% of the cases computer science teachers were responsible for the maintenance of the schools' technical devices, implicating that the use of additional digital devices would further increase their workload. Nevertheless, 65% of our participants used educational robots and/or physical computing devices during their lessons. The systems were also generally perceived in a positive light with the most stated use case being an introduction to programming and the most valued functionality being modular components. In this paper, we present the design and results of this survey.

Keywords: Educational Robotic, Computer Programming Education, New Technologies in Education

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## Introduction

As Computer Science education is becoming more important to schools, so are the tools we use for teaching it. An often discussed approach in the literature is the use of educational robots [3][4] and physical computing devices [5]. For this work, we define a physical computing device as a complete computer built on a single circuit board that focuses on measurements and interacting with other digital devices. In contrast, we define a robot as a machine programmable by a computer that acts either autonomously or guided by a control device and focuses on movements and interaction with its environment. Examples of both device classes are depicted in 1.

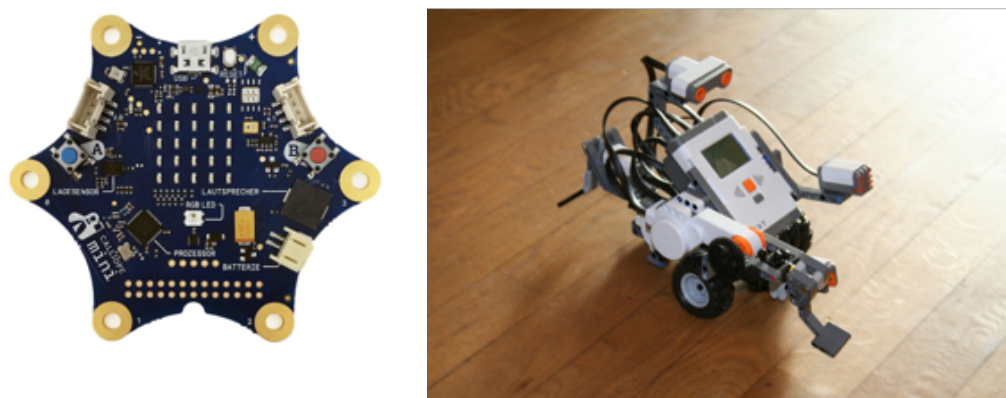


Figure 1: Left the physical computing device Calliope mini [18], right the educational robot LEGO MINDSTORMS NXT [19]

According to the literature, both device classes offer motivating and illustrative access to a multitude of technical concepts [3][4][5]. However, with a vast variety of use cases and available designs, it is not easy to see which devices are most useful for schools, how they can be efficiently used for teaching, and how much additional workload their maintenance and use incorporates.

In this paper, we try to answer these questions by looking at the current situation in German computer science classes. Therefore, we conducted a survey at 114 German secondary schools from 11 different federal states. First, we asked computer science teachers about the current state of their lessons and the additional workload regarding the maintenance and use of such devices at their school. Afterward, we questioned our participants about how educational robots and physical computing devices are used in their respective classes, what positive and negative aspects they see in such systems and how much additional workload they add. The design and results of this study are discussed in the following sections.

In summary, we try to answer the following questions:

1. Are educational robots and physical computing devices commonly used in German computer science classes and what use cases do they have?
2. How should robots and physical computing devices be designed to be most efficient during lessons?
3. How much additional workload do these systems incorporate for computer science teachers?

## Related Work

By now, educational robots and physical computing devices are generally seen by the community as useful tools to increase the motivation and learning efficiency of pupils [1][2][3][4][5].

In contrast to our survey, most work in the literature is either concerned with the effects of educational robots or physical computing devices. The effects of both device classes are however often similar.

Zhong et al. published a systematic review of the use of educational robots in mathematics education. They found that most studies on this topic were conducted with LEGO robots, typically with small sample sizes, with a research focus on elementary or secondary schools. Robots were mostly used to teach and learn graphics, geometry, and algebra, often by using game-like interactions between the students and the robots [3]. A similar literature review was conducted by Belpaeme et al. They noticed that an increasing number of studies viewed educational robots positively, with a high potential for education and tutoring. However, they also noted that the large-scale introduction of such technical systems to the classroom poses a lot of technical and logistical challenges and will therefore likely take some time [4].

Regarding physical computing devices, Chung et al. published a study comparing the performance of two twelfth-grade programming courses. One with and one without physical computing devices. They found that the students of the physical computing course had a significantly higher learning efficiency and motivation in coding literacy than their peers in the control course [5].

Aside from functioning as examples of technical concepts educational robots can also directly interact with the students, e.g., to answer or ask questions. This naturally raises the question of how the robots should interact with the students.

Baxter et al. examined whether it is beneficial in such situations to personalize the behavior of the robots towards young students. They found an increase in the student's learning success with personalized robot behavior vs. neutral behavior [6]. Konijn et al. concluded in a more STEM-orientated study that while robots can be a significant aid for students to learn STEM tasks, the question of how social their behavior should be cannot be answered so easily. They found that more advanced pupils profited most from social behavior, whereas those below average benefited more from neutral robot behavior [7]. A similar study with a language learning focus was conducted by Kennedy et al. They again found a significant improvement in the learning success of their pupils while working with robots. However, they did not find any significant correlation between the learning efficiency of the students and the social behavior of the robots [8].

Regarding the view of young pupils towards robots, Alves-Oliveira et al. found that children often perceived a humanoid educational robot as a friend or classmate. This is especially the case if the robot possesses some kind of social behavior and/or is smaller than the pupils [9]. In the case of non-humanoid robots, Bungert et al. noted that children often first viewed robots as pets rather than inanimate objects [10]. However, in both cases, the exposure to the robots helped the pupils to understand that they worked with programmable machines rather than living beings.

The attitude of pre-service teachers towards such devices was explored by Kim et al. They noted that given a programming education, teachers generally looked positively at robots. The design and necessary assembly of the devices were the main negative points [11]. Concerning physical computing devices, Kalelioglu performed a survey of 50 computing teachers that worked with the micro:bit device. The author concluded that the most used teaching methods with it were live coding demonstrations, pair programming, discussion, collaborative work, and tinkering. Interestingly, strategies teachers used did not always align with what they felt was most effective, with design and code tracing being seen as effective methods but not popular methods [12]. One possible reason for this effect could be the often-described lack of available teaching material for educational robots [13] and physical computing devices [14][15].

## Survey Design

We conducted an online survey with the tool Qualtrics [16]. The survey was split into three blocks. The first block focused on general questions considering the teacher's teaching experiences, starting with the question of who was responsible for the maintenance of the IT structure at their school with the multiple-choice answers "a teacher", "an external person or company", "an administrator at school who is not a teacher", and "I don't know". Afterward, we asked the participants a free text question to describe their positive and negative aspects of teaching computer science. We made clear that this question should be answered independently of the current pandemic. As the last question, we asked our participants if they know of any funding programs in their school that are focusing on girls.

The questions within the second block focused on educational robots and physical computing devices. We started by asking the participants to name the programming languages they were using for their lessons in the different grades they are teaching. This was a free text question. Afterward, we showed the participants a selection of different educational robots and physical computing devices. We asked them to select all devices they had seen before. Following this, we asked them to add in a free text question about all the educational robots and physical computing devices they knew for usage in class that we had not mentioned in the previous question. Then we asked a yes or no question if the participants had ever used a robot or physical computing device in their lessons. Depending on their answer some questions within this question block varied. We still asked all participants if the schools were using robots or physical computing devices in extracurricular activities or any other subjects but computer science. We also asked if robots or physical computing devices were used to participate in competitions and to name them if that was the case.

For every participant who was using a robot or physical computing device, we asked which one they were using. Additionally, we asked in which grade they were used and for which topics. This was a free text question. We also asked which positive and negative effects they saw in using these devices during their lessons and if they had any problems with them and suggestions for improving the devices. Afterward, we asked them to rate on a 5-scaled Likert scale both the influence of the devices on the student's motivation and learning process. The possible options were "very positive", "positive", "neither positive nor negative", "negative", and "very negative". We also asked them if they noticed a difference in handling these devices in the students due to their gender. Following this, we asked which kind of programming language the participants were using with the devices and which one they preferred. We differentiated between block-based programming languages, text-based programming languages, and both. Supplementary, we asked whether it was the software

specified by the devices manufacturer or if they used another software and to name the software if they were. We also asked if they preferred software with an installation or without. Corresponding to the software, we also asked for the hardware the schools used with robots or physical computing devices. Therefore, we differentiated between desktop PCs, Laptops, Tablets, and Smartphones. Afterward, we asked which functions of the robots and physical computing devices were most important for usage in lessons. Lastly, we had the participants order given functions of robots and physical computing devices by their personal preference.

For the participants that hadn't worked with robots or physical computing devices in their lessons before, we asked if they would use devices like this if they were given the hardware by their school.

Lastly, in the final block, we collected personal data about our participants. We started with the Question about their type of school and the federal state in Germany they worked in. Afterward, we asked them how long they had been teaching given the options of "experienced", "newcomer", and "still in training". We also asked about their educational path and how they had achieved their teaching qualification.

### Survey Results

For the survey, 114 teachers from different German secondary schools participated. The schools were from 11 of the 16 different German federal states. In Germany, the school curriculum differentiates between the different federal states. Therefore we considered this in our survey.

A majority of our participants (48 %) taught in the federal states of North Rhine-Westphalia, Mecklenburg-Western Pomerania, and Lower Saxony.

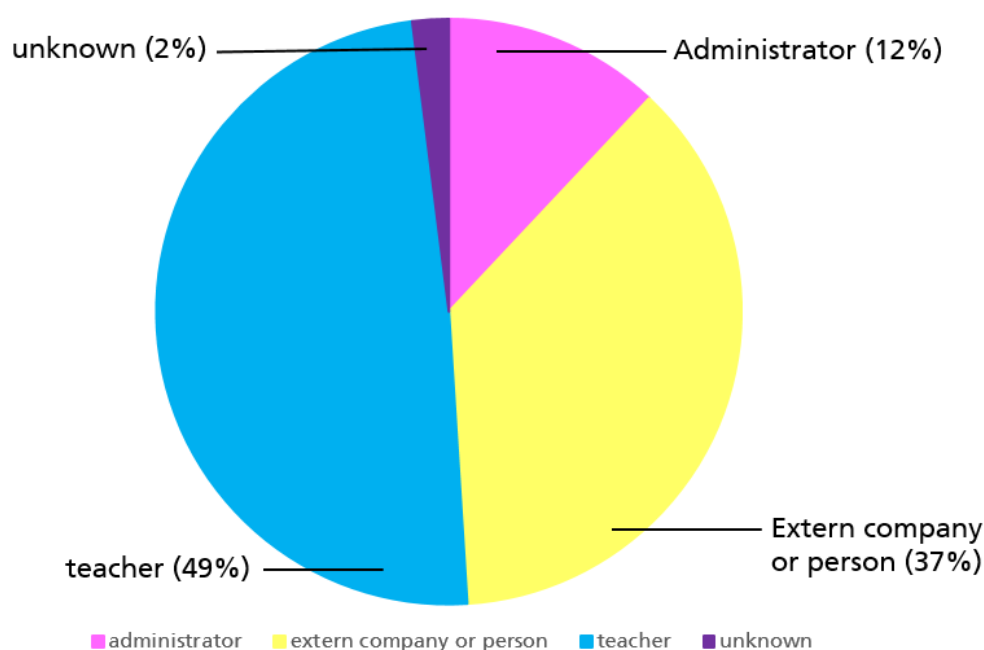


Figure 2: Results for the question: Who is responsible for the IT infrastructure at the school?

Regarding the responsibility of the IT infrastructure in schools, our results show that in most schools (49 %) a teacher is responsible for maintaining the IT infrastructure, as seen in Figure 2.

As positive aspects of teaching computer science, the participants stated that the students are often particularly interested in the subject because it is nonmandatory at most schools and thereby chosen by the students which usually leads to higher motivation than in mandatory subjects. The participants also welcomed the praxis-orientated focus of the subject.

For negative aspects, the teachers named the fact that there are not enough computer science teachers and the lack of proper technical devices at their schools. Also, they criticized that the subject is often used to teach basic IT skills instead of computer science.

77 % and therefore most teachers answered that they did not have funding programs for girls in computer science at their schools. Most of them also did not see differences between genders in their computer science lessons.

The most used programming languages in the teacher's lessons were "Scratch", followed by "Python" and "Java" and the most known robots for schools were the LEGO MINDSTORMS, Calliope, and Arduino. These results are shown in Figure 3. The LEGO MINDSTORMS were the most used robots or single-board computers as well. For the robots or physical computing devices, the participants used mostly block-based programming languages or a mix of block-based and textual programming languages. Mostly, the language depended on the programming environment that came with the device.

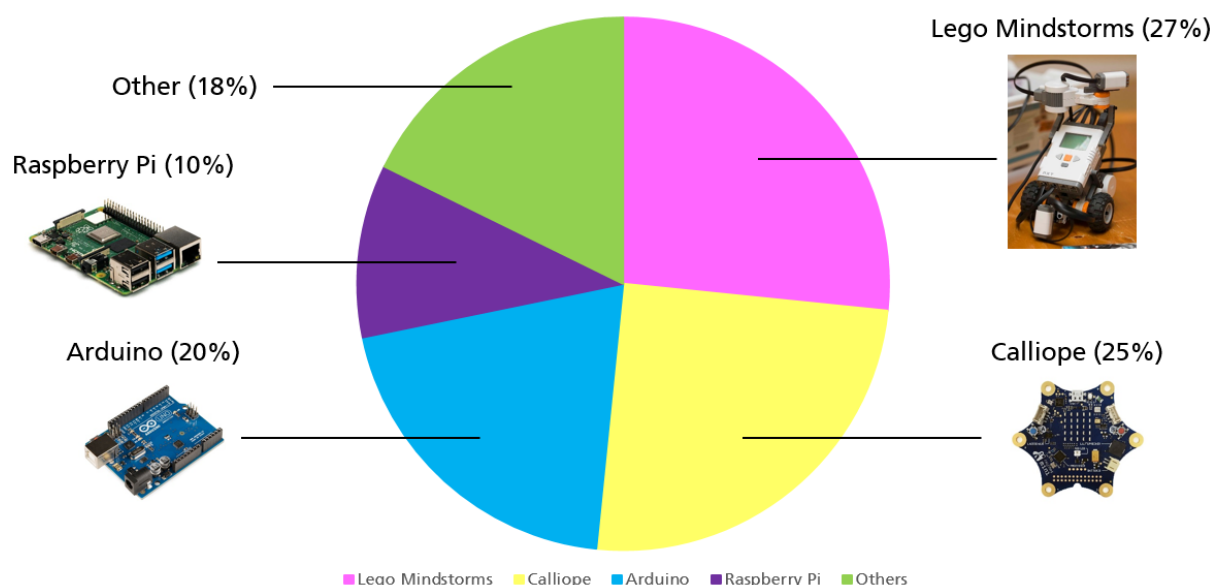


Figure 3: Most used physical computing devices and educational robots by our participants, in ascending order: Raspberry Pi [20], Arduino [21], Calliope [18], Lego Mindstorms [19]

65 % of our participants had used robots or other physical computing devices in their lessons before. The devices were rarely used for other subjects or extracurricular activities, but most schools that had robots did participate in robot challenges. Mostly, both device classes were used for younger grades and as an introduction to computer programming.



All in all, the teachers saw a positive impact from the devices on both the students' motivation and performances in class as shown in Figure 4.

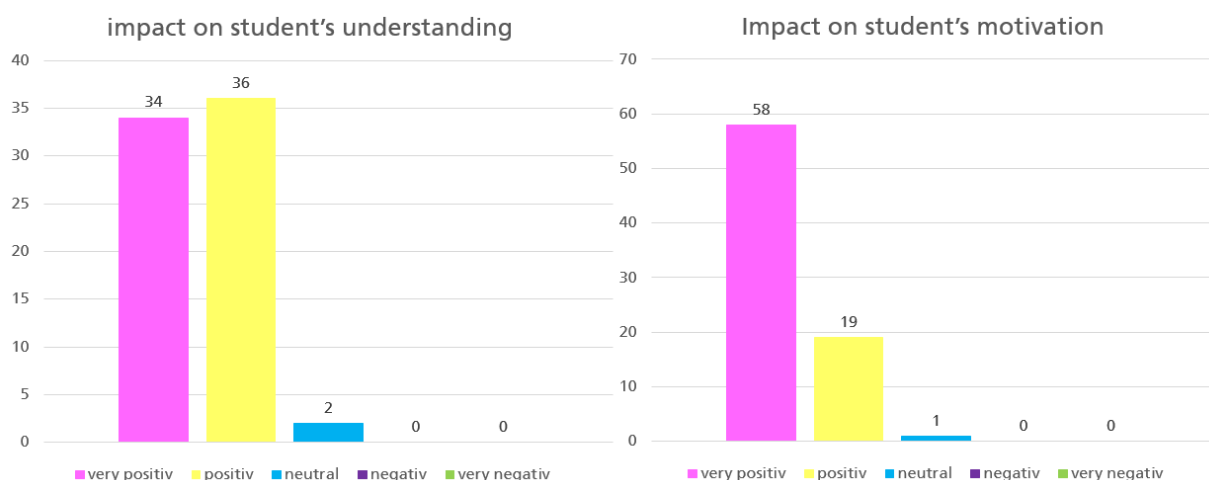


Figure 4: Results for the question about the perceived impact of physical computing devices and/or educational robots on the understanding of lesson-relevant information and motivation of the students

While working with robots or physical computing devices most schools used desktop PCs. Aside from them, laptops, tablets, or smartphones were used as well.

The most valued feature of the robots and/or physical computing devices were the sensors and actors. Our participants also preferred to have the option to change between block-based and textual programming languages and easy handling of both the device itself and the corresponding programming environment. The price of the device and connections via USB and Bluetooth were also criteria for choosing a device for their school.

The only negative aspects that were mentioned more than once in the results were the high costs of the devices and accessories and the high workload to establish the devices in lessons as well as maintaining the hardware.

Most participants (58 %) that had not worked with robots or other physical computing devices before would work with them if given the opportunity. They especially welcomed the practical approach given by the usage of these devices. The main reasons they did not work with robots already were the price and maintenance needed for the devices.

75 % of our participants stated to be experienced in teaching computer science. The others were either new to the job or still in training. 58 % had graduated in the educational branch of computer science, 7 % in general computer science, and 5 % graduated in both disciplines. The rest did not graduate in either of these subjects. After graduation, half of our participants became teachers by doing teachers training as common in Germany. The others were almost equally split between career changers and teachers who visited a certificate course to teach computer science in addition to the subjects they originally graduated in. The results of both questions are visualized in Figure 5.

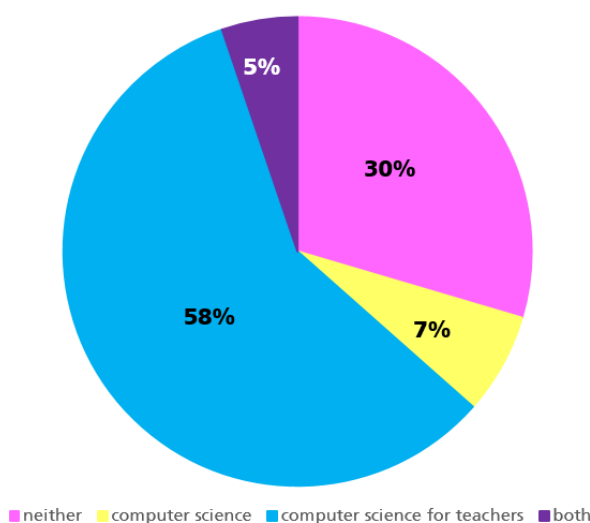
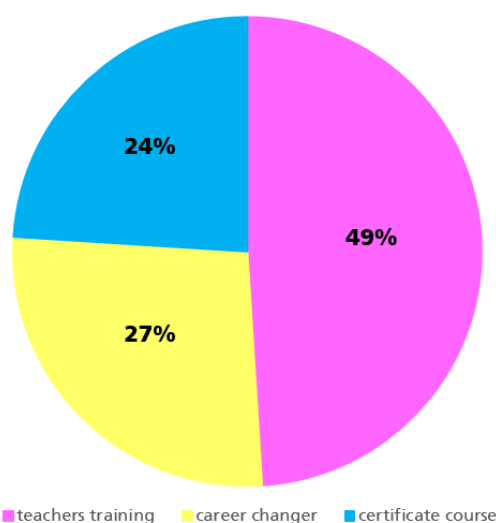
**Subject the participants graduated in****educational path after graduation**

Figure 5: Results for the questions about the graduated subject and education path after graduation of our participants

**Discussion**

### 1. Are educational robots and physical computing devices commonly used in German computer science classes and what use cases do they have?

Robots and physical computing devices are used commonly in German computer science lessons. Mostly these devices are used in combination with desktop PCs or laptops. Some schools also use tablets or students' smartphones, but this seems to be a newer development, especially during the pandemic.

Most schools teach computer science as an elective subject in grades 8, 9, and/or 10. Most secondary schools also teach computer science in the higher grades until the students graduate, but usually as new starting courses, starting with the basics again. In some federal states, computer science is also a mandatory subject for grades 5 and 6 but this too is a newer development. Therefore, educational robots and physical computing devices are often used as a tool to introduce computer science concepts.

The most used programming language in computer science lessons is the block-based language "Scratch". This corresponds to the block-based programming languages being the most used type of programming languages for working with robots or other physical computing devices. Most of these devices have a block-based programming language given by the associated programming environment. The programming language from the programming environment for LEGO MINDSTORMS for example is based on "Scratch". Most teachers are using these associated programming environments. This also fits with the introduction to computer programming being the main topic for the usage of these devices because it is easy to access for the students' first experiences. Some of these associated programming environments also have the possibility of changing to a textual programming language. These are used more for higher grades and in more advanced computer programming courses.

Single-board computers are used more often than educational robots. LEGO MINDSTORMS is the most famous device overall. One reason for this is probably the price. Educational

robots are usually more expensive than single-board computers and most schools are not willing to pay as much for a non-mandatory subject like computer science without having any experience with these digital devices.

Our results support this theory. In the survey, a lot of teachers stated in different questions that the cost of the devices was a crucial factor. Also, single-board computers promise an easier setup and therefore less preparation for teachers. This also fits with our results where the teacher's workload was another crucial factor in both the decision to purchase robots or physical computing devices and which model was chosen for the schools.

The main reason teachers are not using educational robots or physical computing devices in their lessons was also the lack of hardware or the money to buy new hardware and the corresponding higher workload for maintaining the devices.

## **2. How should robots and physical computing devices be designed to be most efficient during lessons?**

Educational robots and physical computing devices were mainly used for younger students and as an introduction to computer programming. They were also used in higher grades for new computer science classes. Therefore, the devices and the associated software must be easily accessible to users. Most teachers were already quite satisfied with the devices they got in their schools if they had them. They saw a positive impact on both the motivation and performance of the students working with these devices.

To teach the basic ideas of computer programming like branches and conditions, the robots or physical computing devices should be able to interact with their environment through sensors and actors.

It was also important to our participants that they could customize the robot or physical computing devices for their own needs or the needs of their study groups. It also personalizes the robots or physical computing devices to the students and therefore encourages a positive view.

Some teachers preferred to have the possibility to change between block-based and textual programming languages to use the robots or physical computing devices in further advanced classes.

Another important criterion is the connection to the school's hardware. The robots or physical computing devices should have an easy and preferred wireless connection with the given hardware.

The surveys' results were not elaborate enough to determine all criteria for educational robots and physical computing devices. To further distinguish the different models of robots and physical computing devices the models must be compared with the teacher's necessary features. Also, more practical tests are necessary to determine the advantages and disadvantages of the different robot and physical computing device models. Therefore, further research is needed to properly answer this question.

### **3. How much additional workload do these systems incorporate for computer science teachers?**

First of all, the workload of teachers in Germany is already high. Mußmann et al. stated that a quarter of the teachers work more than 48 hours a week. This workload has further increased during the fast digitalization during the pandemic by another half hour to an hour [17]. This is especially true for computer science teachers who often have additional tasks corresponding to their schools IT infrastructure. In our results, we found that most schools do not have an administrator. Mostly, these tasks are taken by teachers or an external company. Both of these options mean more work for the teachers. Even if they can contact an external company they still have to respond to them and give them access to the devices. A lot of the teachers also stated that the technical devices at their school are outdated and therefore more errors occur on a daily bases when the company is not present at the school.

Robots or physical computing devices and their introduction and maintenance mean even more work for the teachers. Especially a first setup in schools takes a lot of time that teachers usually do not have.

There is also not a lot of teaching material for working with these devices. So teachers have to prepare a lot more before lessons.

Another problem is the lack of computer science teachers. Not a lot of universities offer the possibility to study computer science for teachers in Germany. Therefore, there are very few graduates, too. At the same time, the subject becomes more important in schools and more schools want to teach this subject. In conclusion, a lot of computer science teachers are needed but there are only a few computer science teachers available.

As a consequence, many teachers choose to participate in a certificate course to teach computer science as an additional subject. A Certificate course is a course usually taught in evening schools for one year, with a full expenditure of time of 320 hours. These courses do only provide a very general overview of computer science topics. Therefore, teachers who choose to teach this subject additionally have a lot more work to catch up on than just participating in the course. As consequence, they often ask for help from their colleagues, resulting in more workload for both teachers.

Possible solutions for teachers' workload could be mandatory introductions of administrators at schools. By doing this the technical problems that increase more every year would be handled by experts and the teachers could focus on their main job in the lessons again.

Additionally, there should be more teaching material available for computer science teachers. Especially in the federal states where computer science is not a mandatory subject there are little to no materials available. In some schools, there is not even a textbook given to use in class.

Lastly, the universities need to focus more on educating computer science teachers. Teachers are needed in schools and therefore they need to be educated properly. Enhancing the certificate courses is another possible solution for this issue.

## Conclusion

There are a lot of educational robots and physical computing devices already used in schools and they are mostly perceived positively by the teachers using them. They claim that the usage of such devices increases both motivation and performance of the students. Therefore, the increasing sight of these devices in computer science classes is supported by our participants and should therefore be further founded.

The most important criteria of these devices are the sensors and the corresponding programming environment. Ideally, the robot or physical computing devices should have multiple sensors to properly teach basic computer programming ideas and also have corresponding software that is both easy to set up and use and can also be used with block-based and text-based programming languages. The software should not need an installation.

Nevertheless, there are still a lot of obstacles for teachers to use these devices in their lessons. The biggest challenges to using educational robots or physical computing devices are the lack of hardware and maintenance of the given hardware as well as the relating workload for the teachers.

Although digitalization is advancing in schools a lot of teachers complain about outdated hardware and a small budget to buy new technical devices for computer science lessons. A lot of the existing hardware is also not properly maintained. This is mostly due to the lack of administration of IT devices in schools. This results in higher workloads for computer science teachers who often take these administration tasks on top of their teaching job. A solution would be to establish properly trained administrators in all schools.

The workload for teachers is already high. Computer science is also still a relatively new subject in most schools in Germany. Therefore, there is not a lot of teaching material and not many computer science teachers in general. On top of that, a lot of these computer science teachers teach computer science as an additional subject and achieved their teaching qualification for the subject through a certificate course that is not sufficient.

In general, while there is still a learning process in teaching the subject itself, physical computing devices and educational robots are a valuable tool for its teachers.

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## ***Influence of Social Media Use on Maternal Educational Anxiety***

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### **Abstract**

In the information age, more educational information could be received by parents with the development of social media, including the excellent performance of other families' children and the advertising of shadow education in China. As the subject of parenting, mothers in China can be more likely to feel strong educational anxiety because of gender division of labor and traditional culture. However, few studies of educational anxiety have considered the effect of social media. Based on the literature on maternal parenting, educational anxiety, and social media, this paper mainly discussed the influence of social media use on maternal educational anxiety in China through questionnaires and semi-structured interviews from the perspective of upward social comparison psychology and gender theory. The research collected 202 valid questionnaires from mothers in China who were aged between 18 and 60 years old. The convenience sampling method was used and quantitative data were analyzed by SPSS 23.0. Besides, 10 mothers volunteered to be interviewed after completing the questionnaire. The results implied that mothers who used more social media can have higher levels of educational anxiety. Under the background of educational industrialization, the educational anxiety that educational institutions sell for profit can destroy the educational ecology to some extent.

Keywords: Maternal Educational Anxiety, Social Media Use, Online Upward Social Comparison, Gender Theory

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## Introduction

The advent of the information age has affected all aspects of people's lives. The way people communicate with each other has undergone a dramatic change from letters to the Internet over the past century, and the emergence of social media platforms has provided a new way for people to access, share and exchange information. Social media can refer to an interactive platform built on mobile internet technology, which realizes value through the publication and sharing of information by users (Kietzmann et al., 2011). The popular social media in China today include WeChat, Weibo, Douban, Zhihu, and Xiaohongshu, where people can express their opinions, share their lives and exchange ideas.

Education has always been discussed intensely, as it can be given the expectation of influencing the social order and the future of individuals (Griffin, 2014). Therefore, there are different kinds of educational information that can attract people's attention including the approaches to improving students' academic performance and educational policy interpretation.

Educational anxiety refers to the negative feelings of helplessness, puzzle and pain felt by the participants in the process of education when there is a gap between the actual performance of the educational objects and the expectations of the people engaged in educational activities (Shan et al., 2016). As one of the most typical features of educational anxiety, parents can be overly sensitive to their children's academic performance, employment prospects and life prospects (Chen & Xiao, 2014). In China, competition can take place during the whole process of study, employment, and even marriage due to the large population and the shortage of quality resources (Weng, 2017). The idea of "expecting children to be successful" and the advocacy of "education can change destiny" make education assume the significant task of improving social status, changing family fortune and realizing class leaping (Wu, 2019). A report about family educational investment suggested that 78.3% of Chinese families expressed a willingness to sacrifice their personal lives for their children's education, and it has been increasingly common for mothers to take care of their children's education full-time (Press, 2019). Under the influence of the traditional Chinese cultural concept of "the man is mainly responsible for things outside the home and the woman is mainly responsible for looking after the family", women can have taken on more responsibility for the internal affairs of the family including taking care of the children (Wang et al., 2021). The role of mothers in Chinese urban families has broken away from the traditional connotation of caring for their children and transformed into an "educational broker" (Yang, 2018). Mothers are devoting more energy to planning and accompanying their children's education in order to help them gain an edge in the educational competition (Yang, 2018).

With the advent of the information age and the awakening of women's subjectivity, women have become more connected to the Internet, and women who have entered the social sphere have quickly adapted to this environment and actively participated in it (Xinlian Communications Insight and Analysis, 2018). In addition, mass communication embodies the moral values of society, and women's social and moral perceptions can be influenced to varying degrees by social media, which can lead to mothers being susceptible to messages on social media that reinforce their maternal responsibilities (Song et al., 2018). In such cases, mothers may feel the pressure from both society and themselves in the parenting process.

## **Theoretical Perspective**

### ***Social Comparison Theory***

The systematic social comparison theory refers that individuals can be driven by self-evaluation needs and motivations to verify the correctness of their own opinions, so as to understand their own abilities clearly (Festinger, 1954). Gibbons and Buunk (1999) further proposed the “social comparison tendency”, arguing that everyone has a natural psychological tendency to compare with others and women can have a higher tendency to do so than men. Besides, social comparison can be regarded as an evaluation of something based on social opinion (Kruglanski et al., 2000).

The emotional impact of upward social comparison on people is divided into two aspects. Under the influence of the assimilation effect, the subject develops a sense of admiration for the better object, triggering a positive emotional experience, while under the influence of the contrast effect, the subject develops an inferiority complex or jealousy after realising the gap that exists between himself and the better individual (Xing & Yu, 2005). Han (2014) suggested that most people tend to choose upward social comparisons to evaluate themselves when making comparisons.

The extension of real-life upward social comparisons to the internet has led to the creation of upward social comparisons on social networking sites, a process whereby users view the bright side of other outstanding individuals and compare themselves to them in terms of specific content during the use of social media (Feinstein et al., 2013).

### ***Gender Theory***

Gender theory was originally proposed by feminist researchers, who believed that the differences between genders were not natural, but the manifestation of social culture shaping the collective (Butler, 1999). Within the heterosexual matrix, individuals tend to perform as the ‘norm’ (Hegarty & Pratto, 2004). Thus, people who are physically male could be expected to behave in masculine ways and demonstrate their masculinity. Conversely, women could be expected to be feminine and to express their femininity through their actions (Butler, 1999; Carrera-Fernández et al., 2018). For example, the role of the women as mothers can be a maternal role assigned by the society, where mothers can be entrusted with the responsibility of accompanying and caring for their children, guiding them in their studies, and socializing them (Jiang, 2016).

This opinion has been vigorously challenged by Maccoby (1988), who argued that it can be almost impossible to demarcate the boundary between masculinity and femininity by assessing because these characteristics are not absolute opposites. However, the binary framework constructed by society can still have a significant influence on the social division of labor.

This study is mainly analyzed from the perspective of social construction in gender theory. In the process of the distribution of social functions between the sexes, there are strong correlations between gender and our duties. Especially in the East Asian cultural circle, the idea that “men work outside and women work inside” has always influenced the construction of social forms. The activities of both sexes are strictly restricted by the social structure (Zhang, 2019).

## Method

In this study, on the premise of referring to existing literature and materials, mothers aged between 18 and 60 were surveyed by questionnaire and interview outline to analyze their use of social platforms and their level of education anxiety.

### *Object of Study*

The convenient sampling was adopted in this study, and questionnaires were distributed to the public through the online platform of Questionnaire Star. A total of 322 questionnaires were collected. According to the selected questions of “gender”, “age”, “mother” and prescribed options, after eliminating invalid questionnaires, a total of 202 valid questionnaires were obtained, with an effective rate of about 62.7%.

Among the 202 valid subjects, mothers aged between 41 and 50 accounted for 49.5% of the total sample. The sample distribution was shown in Figure 1:

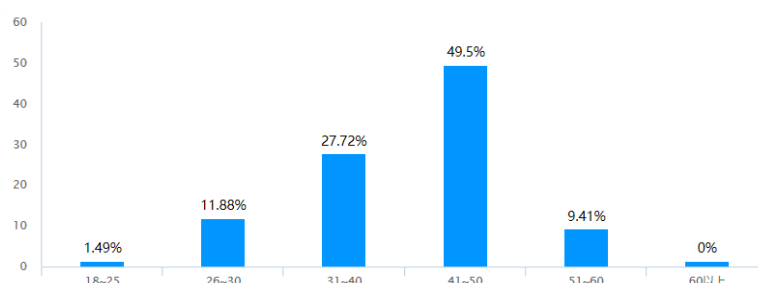


Figure 1: Age distribution of the subjects

In addition, there were 137 mothers who just had one child, accounting for 67.82% of the total. There were 62 mothers with a second child, accounting for 30.69%. The proportion was shown below:

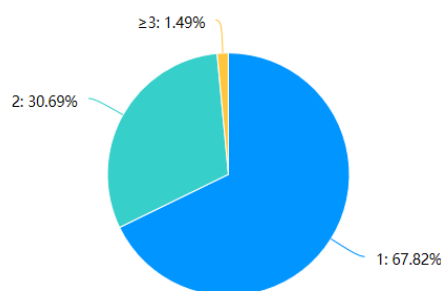


Figure 2: The proportion of the number of subjects' children

Based on the results of the questionnaire, 10 mothers were selected from among those who wished to participate in the interview to conduct a semi-structured interview.

### *Research Tool*

*The Questionnaire on Social Media Use and Educational Anxiety* was used to investigate the social media use and educational anxiety of the subjects from three dimensions, as shown below:

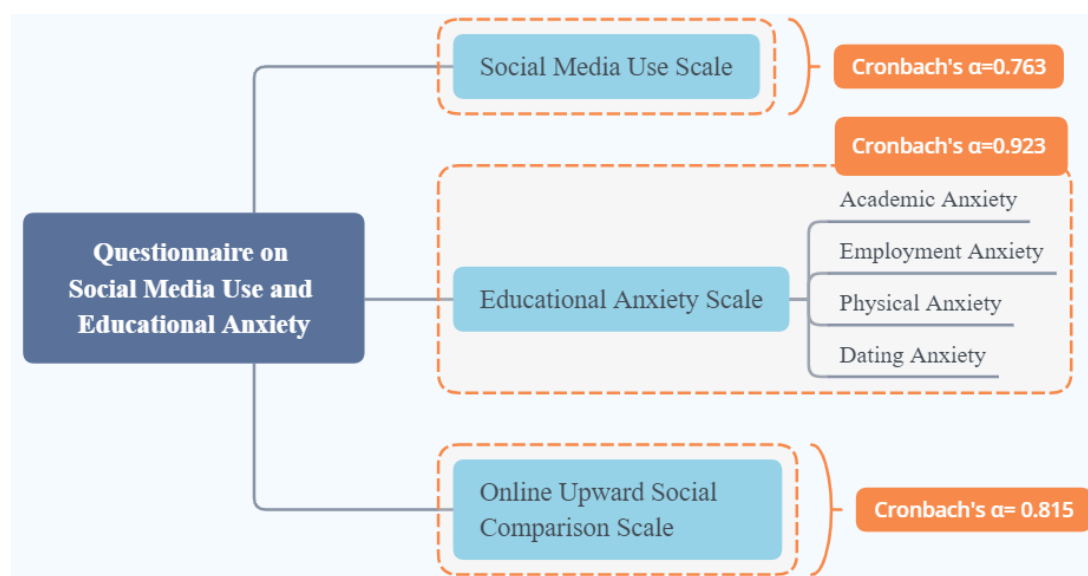


Figure 3: Dimension of the Questionnaire

The results of the structural validity analysis showed that  $KMO=.866$  was greater than 0.7, and the result of Bartlett's spherical test  $P < 0.001$ , indicating that the structural validity of the questionnaire was good.

## Results

### *Descriptive Statistics of social media usage of mothers*

	<i>N</i>	<i>m</i>	<i>sd</i>
Frequency of posting information	202	1.64	.99
Frequency of use of social media other than posting	202	2.98	1.40
Frequency of browsing friends' posts	202	2.92	1.21
Frequency of browsing specific friends' posts	202	2.50	1.24
Frequency of seeing other children's achievements	202	1.75	1.00
Frequency of seeing advertisements for shadow education on social media	202	2.01	1.01
Frequency of browsing education information or retrieving education information on social media	202	2.00	1.08

Table 1: The descriptive statistics of social media usage of mothers

The frequency of posting information is the lowest, about 1-2 times per week. This is followed by a little higher frequency of mothers seeing other parents sharing their children's achievements on social media. In contrast, the frequency of browsing friends' statuses and the frequency of using social media other than posting statuses were both high, close to 1-3 times per day. It shows that the frequency of browsing social media can be higher than posting for mothers, which can imply that mothers may have a stronger willingness to gain information other than proactive sharing.

### *The differences of mothers' anxiety about their children's academic, employment, physical, and marriage anxiety*

Repeated measure ANOVA was performed on the four dimensions of maternal anxiety

towards children. Since the Mauchly test does not satisfy the spherical assumption ( $P=.000$ ), the corrected G-G coefficient (0.855) is used to achieve the purpose of correcting the P value, as shown in the table.

<i>Within Subjects Effect</i>	<i>Mauchly'W</i>	<i>Approx. Chi-Square</i>			<i>Epsilon<sup>b</sup></i>	
			<i>df</i>	<i>Sig.</i>	<i>G-G</i>	<i>H-F</i>
<i>Type</i>	.700	71.295	5	.000	.791	.801

Table 2: Mauchly's test of sphericity

<i>Source</i>		<i>Type III Sum of Squares</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	<i>Partial Eta Squared</i>
<i>Type</i>	Greenhouse-Geisser	45.052	2.374	18.980	28.943	.000	.126

Table 3: Intra-group factor test results

The G-G correction results showed that there were statistically significant differences in the four dimensions of mothers' anxiety about their children's education,  $F(2.374, 477.096) = 28.943$ ,  $P = 0.000 < 0.005$ ,  $P < \eta^2 = .126$ .

<i>Pairwise Comparison</i>					
	$\bar{x} \pm s$	<i>(I) Type</i>	<i>(J) Type</i>	<i>MD (I-J)</i>	<i>Sig</i>
Academic Anxiety	2.93±.72	Academic Anxiety	Employment Anxiety	-.200*	.006
			Physical Anxiety	.422*	.000
			Marriage Anxiety	.242*	.000
Employment Anxiety	3.13±.08	Employment Anxiety	Academic Anxiety	.200*	.006
			Physical Anxiety	.623*	.000
			Marriage Anxiety	.442	.000
Physical Anxiety	2.51±.08	Physical Anxiety	Academic Anxiety	-.422*	.000
			Employment Anxiety	-.623*	.000
			Marriage Anxiety	-.181	.145
Marriage Anxiety	2.69±.07	Marriage Anxiety	Academic Anxiety	-.242*	.000
			Employment Anxiety	-.442*	.000
			Physical Anxiety	.181	.145

Table 4: The difference analysis of mothers' academic, employment, physical, and marriage anxiety

As can be seen from Table 4, mothers have a high degree of anxiety about their children in all aspects, among which employment anxiety is the highest, followed by academic anxiety and

marriage anxiety. The lowest degree of anxiety is about their children's physical quality.

Many mothers can be influenced by the long-prevailing career ideology of “studying hard and getting a qualification from an elite university are aimed to find a satisfying job”, which can have led to mothers’ high concern about their children's livelihood. Besides, academic anxiety can be a constant topic for mothers whose children are still in an environment where they are required to take exams to compete for a position.

### ***Differences in social media use and educational anxiety among mothers of different ages***

According to the data, the age distribution of the participants was between 18 and 60 years old. According to the social standards, mothers aged from 18 to 40 years old were regarded as the lower age group, and mothers aged from 40 to 60 years old can be seen as the higher age group. It can be seen from Table 5 that there is no significant difference in both the age of mothers’ use of social media and their educational anxiety level. It can prove that with the popularization of social media, there might be no significant difference in the frequency of mothers of all ages from 18 to 60 when using social media. Both young and old mothers can find interesting information on social media, and age might not affect their usage. Meanwhile, mothers at all stages of children’s development can face educational anxiety.

	Lower Age Group		Higher Age Group		F	Sig
	M	SD	M	SD		
Social Media Usage	15.73	4.94	15.87	5.38	.192	.662
Educational Anxiety	43.49	14.19	43.30	13.36	.015	.903

Table 5: The difference analysis of mothers’ social media usage and educational anxiety from different age groups

### ***The correlation analysis of mothers’ social media use, online social comparison and educational anxiety***

According to Table 6, there is a significant positive correlation between maternal social media use and maternal educational anxiety level. In addition, mothers’ social media use and their online social comparison psychology are positively correlated. Online upward social comparison can also predict mothers’ educational anxiety.

	Online Social Comparison	Educational Anxiety	Social Media Usage
Social Media Usage	1		
Educational Anxiety	.183**	1	
Online Social Comparison	.247**	.570**	1

Table 6: The correlation analysis of mothers' social media use, online social comparison and educational anxiety

It can be implied that the mothers who used social media more can have higher levels of educational anxiety. When mothers are constantly exposed to the “superhuman mother image” created by social media, mothers tend to have a skewed view of themselves and their children. They might ignore that the educational situation presented on social media platforms has been selected to attract them. Mothers with higher levels of online comparison are more likely to be influenced by information about other children’s outstanding performance.

***The correlation analysis between social media use and mothers' anxiety about their children's academic, employment, physical fitness, and marriage***

	Academic Anxiety	Employment Anxiety	Physical Anxiety	Marriage Anxiety	Social Media Usage
Academic Anxiety	1				
Employment Anxiety	.704**	1			
Physical Anxiety	.461**	.337**	1		
Marriage Anxiety	.683**	.710**	.427**	1	
Social Media Usage	.195**	.109	.158*	.126	1

Table 7: The correlation analysis between social media use and mothers' academic, employment, physical, and marriage anxiety

It can be known that there can be significant positive correlation among the four aspects of mothers' educational anxiety, so the various types of educational anxiety can be predicted from each other. In addition, mothers' social media use was significantly and positively associated with mothers' academic anxiety and physical fitness anxiety about their children.

**The analysis of the interviews**

***Limited social media usage time***

Most mothers indicated that they were busy and struggling with balancing the pressure of family and work. Although two of the interviewees were full-time mothers, dealing with daily household chores and caring for the elderly also took up a lot of their time. Mothers can be restricted in their use of social media, mostly on the way to and from work or after their children have had a break. In China, mothers mainly use WeChat to communicate with others online, and the various parent groups for children have become the main information source for mothers. The study coincided with the outbreak of the Covid-19 epidemic, and parent groups on WeChat played an important role in safeguarding the lives of students. Many of the mothers interviewed said that it had become a daily routine to report their children's health in the group. In addition, teachers also used parent groups to conduct various online teaching through videos and learn about students' learning status.

***Increased discernment of online information***

Although the data of the questionnaire has shown that more mothers are exposed to educational information on the internet, the more likely their educational anxiety will increase. However, the increased flow of information has also enhanced mothers' ability of discerning information on the Internet to some extent. Interviewees generally reported that although they would see some educational advice and information, they would not blindly subscribe to all the views they read. Most mothers expressed an overall positive perception of their children despite their anxiety about their children's development. Mothers tend to initiate emotional regulation and alleviate anxiety through other aspects of their children's strengths when exposed to information about excellent peers of their children.

***Shadow education as a method of relieving educational anxiety***

It is important to note that more than 70% of the respondents felt that their children's



education was a heavy financial burden for them. The constant educational advertisements popping up on social media platforms do play a part in mothers' decision of involving their children in out-of-school tuition. Mothers of younger age group reported that they prefer music, art, sports and English classes for their children aged younger than 7 years old, while mothers of students facing examination pressure may choose academic classes according to their children's academic performance.

## **Discussion**

### ***The effect of social media use on mothers' educational anxiety can be influenced by children's age and performance***

Children's different ages and daily performance can play a role in regulating mothers' anxiety by affecting mothers' views of their children. Specifically, mothers of children of different ages can have different psychological profiles when faced with the same type of educational information. Mothers of preschool children showed more concern when they are exposed to information about physical growth and intellectual development; mothers of children in primary to high school would have mood swings due to information about subject learning and academic achievement; while mothers of children in university and after employment could be more concerned and anxious about information about employment and marriage.

Children's different performances (academic performance and daily performance, etc.) will also affect the mother's attitude to educational information. When mothers see more promotional messages from education and training institutions on social media, the advertised "guaranteed grades", "full-day class schedule for your child's holiday" and "beware of being overtaken by others" can make parents anxious about their children's academic performance. Mothers of students with poor academic performance can be more likely to worry that their children are at a disadvantage in the academic competition because they are not enrolled in extra-curricular classes. Interviews revealed that mothers with high levels of educational anxiety mostly link their children's performance to their own involvement in their children's schooling. Therefore, when they feel educational anxiety, they can be more likely to take action to alleviate their anxiety by enrolling in extracurricular classes and supervising their children's studies.

### ***Anxiety felt by mothers on social media can be more focused on academic performance***

It can be found that there is a significant positive correlation between the time and frequency of social media use by mothers and their academic anxiety for children. Although mothers had the highest levels of employment anxiety for their children, social media use did not have a measurable effect on employment anxiety. It is mainly related to the fact that most of the content shared on social media platforms can be about children of school age, such as videos of hobby classes, volunteer activities, or high school and university admissions. In contrast, mothers' educational anxiety shifts from academic performance to employment and marriage anxiety after their children enter university. Most of the content about their children's employment or marriage would not be shared on social media platforms, but rather in private, face-to-face conversations. It is also found that mothers' anxiety about their children's marriage can be focused on choosing a spouse, while their attitude towards puppy love has been more moderate. Compared to the previous strong social and family attitudes towards puppy love, most mothers nowadays have an understanding attitude towards their children's puppy love, but they also expressed the opinion that such experience should not affect

children's academic performance.

### ***Educational messages in social platforms can be a double-edged sword***

According to the interview, it is common for mothers to be guided by public opinion and choose to give extra lessons to children. The educational advertisements that constantly pop up on social platforms will indeed be one of the factors for mothers to sign up for classes to some extent. More than 70% of respondents believe that their children's education has brought heavy economic burden to them. However, in contrast to previous studies, this study finds that the increase of information channels also enhances mothers' ability to discriminate against online information.

## **Conclusion**

### ***How much does "mothering love" weigh***

The role of fathers in children's education can be self-explanatory, as it has been said that "it is the father's fault if his children are not well educated" from ancient China. However, when there are problems in the upbringing of children in reality nowadays, friends and family and even the mothers themselves attribute the fault to the children's mother, which reflects the fact that men, who are in a dominant position in the social power system, can impose the responsibility for parenting faults on women by controlling the discourse. From the perspective of intensive mothering, it has been generally accepted that mothers are the preferred caregivers of children and therefore mothers should put their children at the center of their lives and even give up their own interests in order to care for children (*Intensive Mothering*, 2014). This concept of intensive motherhood has been extended to the field of education. In China, there is even a phenomenon called "widowed parenting", which means that the mother is forced to be tied to their children, and the absence of father in the education of their children can be considered understandable (Jin & Yang, 2015). "Widowed parenting" undoubtedly puts pressure on mothers in terms of marriage and life, as well as the development of their children. It can be regarded as a reflection of the unequal status of the sexes in the structure of the family.

Economic development has liberated women from the home but has not recalled men to the family. In addition, the gap between family and social functions still requires women to sacrifice their own time and energy to fill it. Unequal gender systems can be reinforced again in the division of labor in childcare. The emphasis on education does not mean that the role of education belongs exclusively to the mother, but that the scope of maternal love should also be treated fairly in the process of reconstructing the gender system. Therefore, the return of fatherhood can have a positive effect on both children's development and families.

### ***The process of education industrialization and the selling of education anxiety***

The rise of the knowledge economy has made education an institutional "exit" to change the destiny of individuals and families (Lauder et al., 2006). The importance of education has been certified from individuals to states. Besides, the evaluation system, with grades as the main criterion, has led to students being defined by "numbers" and constantly labeled into hierarchical categories such as "top students" and "under-achievers". Based on the high priority given to education by society and the strong educational anxiety of parents, shadow education has developed at a high speed. The Chinese Society of Education (2016) reported

that the national market asset size of primary and secondary school tutoring institutions exceeded RMB 800 billion, with 137 million students attending extracurricular tutoring in China. On the one hand, educational institutions can heavily advertise to attract consumers to buy services by emphasizing the importance of grades. On the other hand, mothers who feel educational anxiety can take action to increase their child's competitive edge, such as seeking help from extra-curricular providers (Pan & Wang, 2020). Educational anxiety can be built up during this process, which even could lead to the Bandwagon Effect in extracurricular tuition. Therefore, it may be not a healthy path for the education industry to make a profit by selling educational anxiety. Education and training institutions should make reasonable use of the professional knowledge and skills of their staff to truly focus on student's development and alleviate parents' educational anxiety.

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***The Use of LLT Materials in China's EFL Classrooms: Making Learner Engagement in Classroom Talk Visible***

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**Abstract**

Language learning and teaching materials (LLT) are crucial parts of language classrooms. However, how these materials are used by students and teachers during EFL classroom interactions is still understudied. In response to calls for empirical research on materials use in language classrooms, this classroom-based study examined the use of LLT materials in China's integrated English classrooms for English majors and explored students' language learning engagement with materials in materials-prompted turns. Based on a conversation analytic treatment of 90 relevant episodes culled from 36-hour videotaped EFL classroom interactions, this study explores (a) the types of LLT materials used in China's English classrooms, (b) the extent to which students engage with LLT materials in terms of the different characteristics of the discourse patterns elicited by the materials. Results show that language teaching resources offered by three ELA teachers are no longer homogeneous, with all five dimensions of materials (physical entities, texts, signs, environments, and technologies) being used and synergistically generating meanings in classrooms for intermediate learners. Nonetheless, textbooks remain the most commonly used type of instructional materials in EFL classrooms. Additionally, LLT materials have been proven to have a significant impact on teacher-student classroom interaction, prompting turns in direct or indirect ways. Different materials-discourse relations provide students with various space for engagement and topic selection by offering distinct possibilities and constraints, and thereby impacting learner agency in classroom talk. This study reveals how instructional materials and classroom discourse interact to provide language learning opportunities.

Keywords: LLT Materials Use, Learner Engagement, Classroom Talk, EFL Classrooms

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## Introduction

Materials are one of the essential elements of the classroom and serve as the primary language input for teachers, both inside and outside classrooms. In the early days, the materials used in the teaching practice only took a single form, and the notion of materials was restricted to textbooks, often ignoring the complexity and diversity of the materials themselves and conflating them with the concept of textbook use. Today, the definition of materials has been expanded to encompass all artefacts used by learners to facilitate learning and language use (Tomlinson & Masuhara, 2018). Additionally, Guerrettaz et al. (2021) Summarized a particular classification of language learning and teaching materials (hereinafter referred to as LLT materials), as a collection of different dimensions, consisting of five broad categories: physical entities, texts, signs, environment, and technology.

In recent years, language education field has taken a materialistic turn away from a focus on human behavior or language systems to a focus on materials, with the goal of advancing the depth of research on teaching materials (Pennycook, 2018; Toohey, 2019). Previously, only a small number of scholars explored language teaching materials used in the classrooms, usually focusing on two themes: firstly, content analysis of materials, and secondly, materials development, design and evaluation. In general, materials use has not been fully explored (Harewood, 2021), hence in 2021, *The Modern Language Journal* published a column on materials use, examining the use of materials in different contexts or the resulting interactions, which has attracted academic attention.

However, over the past thirty years, the overall number of relevant studies conducted in China is still insufficient. While early studies mostly addressed the use of primary and secondary school textbooks (Luo and Xu, 2011), some researchers recently have started to focus on the use of university textbooks (Xu and Fan, 2017), online textbooks, foreign textbooks, business English or industry English textbooks (Liu & Jiao 2021), primarily using self-reporting (e.g. questionnaires and interviews) and qualitative case study methods to examine how teachers use textbooks generally or individually. And other non-commercial materials used in the teaching process were not taken into account by researchers, who equated language teaching materials to textbooks. Additionally, little is known about how teaching materials and classroom discussions interact.

A recent study on the qualitative dimensions of the textbook-discourse relationship was examined by Guerrettaz & Johnston (2013) in terms of three dimensions of classroom discourse (theme, genre and discourse structure), where the mediating role of textbooks and their influence on the structure and content of discourse were highlighted. Nevertheless, there are only few relevant research, and the majority of them focus on using a single materials (i.e. textbooks). While the conversational nature of textbook-prompted turns had been examined, little is known about the participants' dynamic behavioral manifestations in classroom discourse.

The current study, based on an ecological view of language acquisition (van Lier, 2004), aimed to explore the dynamic behaviors of both teachers and students in different turns elicited by LLT materials, and to discuss the relationship between materials use, classroom discourse and language learning, in the hope of shedding some light on the research on materials use, related ELT materials training and development of English language teaching materials in higher education. To be specific, it explored the use of LLT materials in real EFL classrooms in China and classroom participants' agentic behaviors in classroom discourse via



asking two research questions: (1) What language teaching and learning materials were used in China's EFL tertiary classrooms? (2) What agentic behaviors were displayed by both teachers and learners in the turns directly and indirectly prompted by LLT materials?

## Results and Discussion

Figure 1 shows that three teachers provided language learning and teaching materials from a variety of dimensions, such as physical entities, texts, signs, and technologies. And the classroom setting, including multimedia equipment, conventional instructional tools and rows of desks, was thought of as an additional dimension of LLT materials supplied to establish a conducive environment for language learning. It is worth noticing that, in terms of texts category, both teachers' verbal explanations and students' language work are subcategories that emerged from the coding process. Words, as one subcategory of the signs category, were presented frequently in the classroom, given the excellent fit between its usability characteristics and the type of curriculum. For English majors, *Integrated English* is a required core course, and the units of the textbook draw their themes from the two reading materials. Words or expressions from various types of learning materials are one of the primary classroom learning resources, as teachers tend to start lessons with key words and language expressions in the reading texts in order to fine-tune the text, extend their understanding of language and culture, and to repeatedly check vocabulary use.

Among the category of physical entities, students' notebooks were shown to be frequently used in classrooms. Students reported in the after-class reflections that they enjoyed taking notes on key learning points in order to organize thinking, internalize new information, and relate old and new information, either as a result of their high school study habits or on the suggestion of their current teachers. In the digital era, digital devices like Huawei, iPhones and iPads are also seen as crucial learning resources, and the language learning apps, such as electronic English Dictionaries, emerged as the primary reference material for most students.

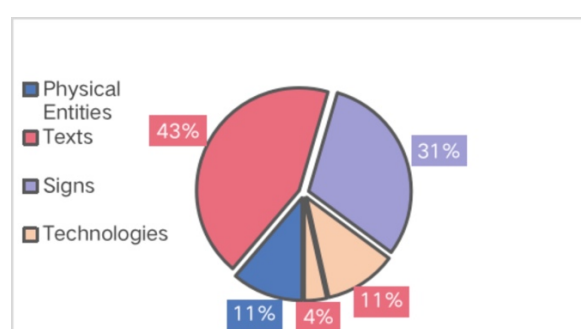


Figure 1: LLT Materials Use in Three Classrooms

In general, the language learning and teaching materials provided by the three teachers were no longer homogeneous and took on a multimodal dynamic. Textbooks continued to dominate the classroom as the primary medium for organizing lessons and providing structure and content for learning activities (Gueratazze & Johnson, 2013), and materials of various modalities were used collaboratively by teachers to optimize language learning conditions. As the way in which textual symbols are carried develops and eventually enriches the written language modality, projectors, large screens and PowerPoint were being used more and more frequent in tertiary classrooms, and students' attention was increasingly being drawn to the metaphorically presented images and electronic documents (Matsumoto, 2021).

Additionally, given the limitations of the reading materials in textbooks and classroom activities, in order to avoid demotivating students and negatively affecting their emotional involvement and language use, teachers selected modal connections to connect written text in textbooks to spoken language, utilized spoken language modalities to further or clarify language knowledge (including vocabulary, expressions, learning strategies, etc.), explained phonological or grammatical rules, provided examples to highlight cultural differences, and occasionally employed additional modalities such as gestures, images, blackboard writing, and stick drawing to support instruction. Through the collaborative use of different modalities, teachers mobilized a wide range of classroom learning resources to create a lively and effective classroom context and optimize language learning conditions.

In the classroom ecosystem, the interplay between discourse and language teaching resources is crucial, acting as a vital source of resources and sustenance, assisting in meaning-making, promoting perception and action, and ultimately affecting learner agency. In accordance with Gueratazze & Johnson (2013), the current study identified the turns prompted by LLT materials into two types: directly-prompted turns and indirectly-prompted turns. The former describes turns in which students use the same vocabulary from the text (not only from the textbook) or provide a prescribed answer directly derived from the text, whereas the latter describes turns that have no evident relationship with the text and only involve themes generated from it. It was found that teachers and students, as the agents in classrooms, demonstrated different behaviors while participating in interactions, due to the distinct discourse features and various interaction space that the turns provided. Hence the agentic behaviors of both teachers and students were examined by using the CA with video, to clearly elaborate the interaction between classroom discourse, materials and language learning.

Directly-prompted turns occurred in scenarios such as checking answers, comprehension and reviewing. Materials such as textbooks, signs, or textual discourse (spoken or written materials) were involved. As shown in extract 1, this turn was prompted directly from the language exercise question (Question 4) in the textbook. The purpose of the discourse was to gauge students' comprehension of the key word 'beam' and to try to elicit a response from the students to the language exercise. Due to the closed nature of this classroom activity, only limited discourse participation by the students was allowed.

### **Extract 1: Language exercise - a turn elicited by key words in the reading text**

- 310 T: Yeah, number 4? Feng?  
 311 S9: There is.....  
 312 T: Okay, so in this sentence you can see (.) the slight a slight difference between beam and smile. So I want you to check in your dictionary. What's the illustration, explanation for smile and beam, which means, if I ask you to BEAM, if I ask you to SMILE, whether these two gestures will be SLI(..)ghtly Different. (0.2) Look up the word 'smile'↑ and beam in the dictionary to find the English explanation of these two words (.) and try to understand their gestures. Simply put, are smile and beam, the degree to which they smile, the degree to which your mouth grins, the degree to which you show your teeth, the same? Which one moves more? Which one moves less? (0.5)

(Students used their mobile phones to look up the electronic dictionary, and the teacher was waiting for students to consult it.)

- 313 T: [Which movement is bigger?  
*[T leaning forward]*

Image 1



- 314 SS: Beam.

- 315 T: While pronouncing 'beam', the movement should be bigger, right?  
 That means, in short, that [the mouth grin should be a little bigger.

*[T Pointing both index fingers to the corners of the mouth]*

Suppose, for example, you're going to a photographer to take a picture ↑for your passport↑(.), for your identification card↑(.), and then (.) would you SMILE ↑or would you BEAM?

Image 2



- 316 SS: [Smile.

*[T saying 'smile' with students]*

- 317 T: Yeah, you want to show [less of your teeth, right? Okay↓. But beam it  
*[T lifting his left hand to his slightly parted lips means you're*  
*[Genuinely happy. You're [genuinely delighted to do that,*  
*[T's hands arching up*  
*[T's hands arching up and and turning outwards turning outwards right?*

Image 3



Image 4



Extract 1 shows that teacher A controlled the sequence of turn, allowing limited space for learners to interact. The conventional IRF model (question-answer-evaluation) was

commonly seen in classroom interaction. Learners' responses were prescribed answers, and teachers provided direct form-focused feedback on most of these answers. The responses by learners were restricted to one or two words (lines 314 and 316) without clarification checks. Obviously, they were not free to choose and develop topics in the turns. Thus, in order to transcend the constraints imposed on the discourse by the supplying character of a single material, other LLT materials were used to enhance the classroom use of language exercises and offer more space for interaction, such as electronic dictionary software, teachers' verbal explanations (Line 315), gestures and facial expressions (figure 1-2).

Indirectly-prompted turns occurred less mostly in scenarios such as lead-in, pre-learning, and post-reading. The turn was usually initiated by the teacher, and learners do not have to give prescribed answers. Even though the IRF model still occurred, authentic communication was more likely to be achieved due to the authenticity of the topic. As a result, learners' discourse volume increased significantly, their turns were extended and their role in the discourse changed from that of a passive recipient to one that allowed for some engagement and reflection.

### Extract 2: Lead-in activity - a turn elicited by the reading-text theme 'Flowers'

253 T: Ok, now, so <now>, you KNOW(^) a dozen huh two dozens of words for (-) the flowers, right↑? But, you know(.), actually in our daily life, we CAN have a LOT↓ of occasions on (.) which we have flowers↑, right? So (.) [Have you ever sent flowers to somebody?

*[T turning body back from the right to face the class*

254 SSS: Ye (: ) s↓

255 T: [For example↑?

*[T tilting body slightly to the right in a listening position*

256 S12: My mother.

257 T: Mother↑?

258 S13: Teacher

259 T: Teacher↑, [the teacher.

[Sister?

*[T's right hand index finger pointing to the source of the sound*

*[T turning to the right and pointing the right index finger towards the source of the sound*

260 S13: Friends. [Freinds.

261 T: [Friends, yeah, ok.

Image 5



The turn topic shown in extract 2 was derived from the theme of the textbook reading text, and the reference questions and the texts in the slides involved in the turn were the textual LLT materials. The teacher initiated the turn by using a series of provided group discussion

questions a) ‘Have you ever sent flowers to somebody? b) On what occasion would you send flowers to someone? c) For what purpose?’ to recall learners’ personal experience. Learners actively participated in the ask-and-answer activity, even though the answers were only one or two words long (lines 256, 258 and 260). There was an increase in the diversity of English words used, and their oral output was no longer a mimicry of the teacher's words or a copy of ‘sister’ from the teacher.

Student participation in the co-construction of the discourse was found to be, however, minimal as they had little control over how the turn was structured and were accustomed to responding in fragments. Hence, to free learners from the constraints of general responses ('Yes'), teacher B employed signs (eye gaze, gestures, and facial expressions), or she asked, "For example? ", to extend learner turn. Additionally, teacher B used conversational strategies to direct learners’ attention and improve classroom interaction as a means of advancing classroom discourse. For instance, she used ‘teacher echo’ subtly to boost learners’ involvement in all dimensions, particularly emotional engagement (see learners’ facial expressions in image 4).

Furthermore, in addition to teachers’ active awareness of the usability of a variety of LLT materials (in oral or written form), learners, as agents in the classroom interaction, were supposed to perceive the symbolic resources in the materials, actively interpret their meaning, and take appropriate action when interacting with the environment. Extract 3 shows the oral explanations were provided by the teacher as the LLT materials to introduce the theme and language use in the poem (lines 258 and 262). Through textual and conversational importance markers, teacher B put an emphasis on key information, such as ‘Scottish dialect’ and ‘love poem’, in the lecture for learners’ perception. After perceiving the stressed points, learners took the initiative to try out using Chinese dialect words mostly used in Hebei, Henan, Shandong and Shanxi, China, in the English-Chinese translation work. For example, in lines 268 and 271, ‘俺’ and ‘妮儿’ were used to replace ‘my’ and ‘a girl’ in the Scottish poem. Also, due to the strong connection between the theme ‘love’ and their personal experiences, learners were shown to engage themselves in this activity, through applauding enthusiastically, shouting like ‘Woo’, laughing, facial expressions and heated group discussion performances.

### **Extract 3: Introduction to the English poem - the teacher’s verbal explanations (materials used)**

258 T: It’s more difficult for you to defer the words in the song, right? Okay, it doesn’t matter. So anyway, you can find that (---this is a (<VERY↑ VERY↑>) famous POEM written by (.) Robert Burns↓>). >Have you ever heard of Robert Burns<? A very famous (.) SCOTLAND national poet, so a red red ROSE↓, Urh I think that in my mind this is the poem which is (.) very very popular, closely related to [a kind of flower. Maybe JUST because of this  
*[T Raising the right index finger to the mouth*  
 [song, you know (.) (---why are RED RED ROSE (<is symbolizing  
*[T turning around, raising the right hand and pointing to the PPT*  
 (.) [LOVE>). Clear↑?>) Yeah, [so you can find out  
*[T nodding downwards [T double hand clapping*  
 [HERE (.) altogether in this poem you  
*[T pointing the right index finger at the PPT*  
 can find [four stanza. Notice FOUR stanza, [(<one, two, three,

- [T's right hand pointing to [T's right hand pointing  
'stanza' displayed on the BB to the 4 stanzas on the PPT*
- four>). So (.) what does stanza mean?
- 259 SS: 节(jie)
- 260 T: 节(jie), 诗歌的节(shi ge de jie). Okay, four stanza↑..So next (.) I would like you to UNDERstand the poem AND THEN translate it into (.) Chinese, I'll give you (.) 5↓ minutes, but you will do it in (<LARGE↓ groups>).

(T divided the class into four large groups)

- 262 T: Now, by the way, you must have noticed that some of the words are filled in a very strange way. Have you noticed that? For example, you know “luve” means “love” L O (.) V (.) E, right? Yeah, so here pay attention, urh, because just I mentioned Robert Burns was a Scottish poet, so we got **a dialect**. You know Scottish? 苏格兰 (Sugelan). So Scottish dialect, for example, L (.) U (.) V (.) E (.) means L (.) O (.) V (.) E (.) . And melody. Have you noticed how melodies spell? M (.) E (.) L (.) O (.) D (.) Y (.) . Yeah, this is somewhat we call **DIALECTS**>).

Hence it can be concluded that the teacher, learners and the environment are seen as a whole while using LLT materials, creating a space for discursive interaction, building up a classroom atmosphere conducive to the optimization of learning conditions, enhancing learner agency, and promoting and sustaining a good, highly appropriate interaction between the three.

## Conclusion

In response to calls from academics to conduct classroom-based research on the use of teaching materials, the study examined the use of LLT materials in EFL tertiary classrooms for intermediate learners in China. It also exposed the agentic behaviors of both teachers and learners to get a glimpse of how agents were involved in the interaction between LLT materials and classroom discourse. The findings show that the textbook remained the core language classroom material, and other materials were used as scaffolding to the textbook to enhance language learning. Different material-discourse relations (direct and indirect) provide various levels of affordances for language learning. Both teachers and students should take full initiative. Although the sample size is not large enough in this study, the current study has drawn EFL teachers' attention to the classroom use of LLT materials and helped to develop a more holistic multimodal view of materials. It has provided an alternative perspective for teachers to effectively use and evaluate the classroom use of teaching materials, finally offering insights into the development of English language teaching materials in China's tertiary education.

Future work can focus on certain types of materials that are frequently used in the local instructional contexts to deeply explore the interaction between the use of meaning-making resources and classroom discourse, to explore more evidence to substantiate and develop the findings in this study as understanding how the relationship between materials use, discourse, and learner agency is established, and to suggest effective strategies for classroom use of LLT materials.

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## ***Creating a Student Community in an Online Space: The Romance and the Reality***

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### **Abstract**

This study aimed to explain the romance and the reality of creating an online community for Master's students in the COVID-19 context, and investigate the barriers and enablers to engaging in community online. In the urban university where this study was conducted, there are large postgraduate taught programmes with students who differ in their ability to thrive and flourish in the online learning environment due to the COVID-19 pandemic. Students appeared to have been missing the 'hidden' academic and social opportunities that are normally available on campus which allow them to become part of an academic community. Therefore, an internally funded project was developed to enhance students' social and educational experience. The project included an ongoing series of online events across the spring and summer Terms in the academic year 2021/22, that revolved around peer support, support for academic work, and support for career development and beyond. A focus group was conducted at the end of the project with five students, discussing their perspectives on the events they attended, and their possible explanations for the low uptake despite students' initial enthusiasm. The findings showed that students valued the social dimension of the online events and the informal space they created, which helped alleviate stress regarding academic work. Students explained the low uptake by discussing the substantial 'virtual fatigue' they experienced, the lack of daily connection with peers, the impact of time constraints and the language barriers for international students.

Keywords: Online Community, COVID-19, Postgraduate Student

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## Introduction

### ***Background: a project of creating online community***

In the urban university where this study was conducted, there are large postgraduate taught programmes with full-time, part-time, and flexible students, who differ in their ability to thrive and flourish in an online learning environment (Besser *et al.*, 2020). During the academic year of 20/21, a survey and module evaluations completed by students in one Master's programme, identified issues arising from online learning and suggested potential support that could be provided. Students who had planned on studying in person, given the current COVID-19 context, had to study online only.

In response to these circumstances, an internally funded project, *Learning Together: Creating Online Peer Support Community*, was developed by two Postgraduate Teaching Assistants (PGTAs) and two tutors in one department in the university, to enhance students' social and educational experience. The purpose of the funding was to provide support to students and staff who wished to work together to enhance the learning experiences of students, by seeking students' voices, and responding to them in partnership with the students. Thus, the project leaders began by seeking Master's students' perspectives through an online survey on their learning and social experience at the end of Term 1, and found that many students expressed their need to have informal spaces to meet with colleagues and tutors. This need appeared particularly relevant to students in the COVID-19 context because learning was conducted entirely online, and they appeared to have been missing the 'hidden' academic and social opportunities that are normally available on campus which allow them to become part of an academic community.

Thus, the project team aspired to support Master's students in the department during Terms 2 and 3, with the goals of creating an online peer support and learning community. The project included an ongoing series of events, including (1) bi-weekly drop-in sessions, where students had the opportunity to join live Zoom sessions with the PGTAs and have unstructured conversations with their peers about their coursework and daily experiences; (2) five writing workshops, where students attended Zoom sessions, stated their writing goals and wrote during structured writing blocks; and (3) three alumni talks, where alumni from the department spoke about their experiences following the completion of their Master's programme, and revolved around support for career development and beyond.

While students initially expressed enthusiasm regarding the implementation of this project, and while events in Term 2 saw an increased number of attendees as time went on, this enthusiasm did not last long. The number of attendees began to fall at the end of the second term, and very few students attended the events in the third term. Additionally, the project team initially set up an online communication platform for the students with the purpose of providing a space for the students to communicate with one another without the presence of tutors; however, most students did not join the platform and it was therefore not in use. Therefore, the study reported in this paper aims to explain the romance and the reality of creating an online community for Master's students in the COVID-19 context, and investigate the barriers and enablers to engaging in community online. The researchers thus conducted a focus group with five students who attended some of the project events, and sought to understand their experiences from the project and perspectives on the events.

## Literature Review

### *Exploring effective online learning pedagogy*

Online learning as a concept and as a keyword has consistently been a focus of educational research for over two decades. The essential elements of online learning were found to be the use of technology, time element (synchronous or asynchronous), synonymous terms and overlapping concepts (e.g., e-learning), interactivity, physical distance, and educational context (Singh & Thurman, 2019; Burke *et al.*, 2021; Vonderwell & Zachariah, 2005). Online learning on its own has advantages as part of a blended learning approach in addition to face-to-face learning (Adedoyin & Soykan, 2020; Bessser *et al.*, 2020).

By exploring effective online learning pedagogy, the focus of research tended to shift from how technology was used for automated grading or feedback, to student engagement, student-centered pedagogy (Burke *et al.*, 2021) and interactivity as key elements of online learning (Singh & Thurman, 2019; Burke & Larmar, 2021). The ongoing development of online learning pedagogy might also cultivate an idea of identifying student engagement as a key predictor of online learning outcomes (Brown *et al.*, 2022). Moreover, while early definitions of online learning emphasised the role of instructors who developed their material into suitable online teaching recourses (Bolliger & Martin, 2018; Vonderwell & Zachariah, 2005), later definitions delved into the discussion about creating a learning environment and started concerning ‘lack of community’ as an issue in online learning (Singh & Thurman, 2019, 301). A recent study revealed the *unmeasurable* elements found to contribute to online engagement quality that university-level students highly valued, which included reflective student-centered pedagogy, establishing personalised and human connections online, distinguishing online teaching from on campus teaching, and intentionally combined pedagogical approaches (Burke *et al.*, 2021).

While online learning enabled access to study for many students who formerly might not have been able to access it due to various reasons, there were also considerable concerns over the effectiveness of online learning (Bettinger & Loeb, 2017). Particularly, online students have often been found to experience a sense of isolation and disconnection (Dixson, 2015). Greenland and Moore (2014) raised concerns over online students having a 20% higher attrition rate than on-campus students. Because online students tended to represent ‘adult learners who face competing demands, including family and work responsibilities’ (Redmond *et al.*, 2018, p.185); these competing demands, time constraints (Farrell & Brunton, 2020) and financial responsibilities (Busher & James, 2020), were reported to impact the online learning experience and student retention. These contextual issues further promoted a demand for studying flexibility in online learning, as well as for marketing the concept of online learning (Stone & O’Shea, 2019); however, studies revealed that this flexibility in practice ‘may be compromised by the application of inflexible university rules and regulations’ (Stone *et al.*, 2019, p.27), thus the online learners’ expectations remained unmet.

### *Students’ needs emerging in the Covid-19 context*

Despite the ongoing research on effective online learning pedagogy, the Covid-19 pandemic resulted in an abrupt, unplanned transition to various forms of remote and online learning for universities around the globe in the first half of 2020, presenting a range of novel challenges to university staff and students (Burns *et al.*, 2020). In light of these events, exploring the capacity of the higher education sector to adapt to sudden states of uncertainty, overcome the

challenges that they present for the students and provide suitable support for students has become imperative (Burns *et al.*, 2020; Peimani & Kamalipour, 2021).

Like many other universities, the university where this study was conducted also faced the abrupt nature of the shift to online learning, and the literature shows that this has resulted in many challenges experienced by university students. One main challenge has been higher levels of stress, isolation, anxiety and loneliness among students, owing to a reduced sense of belongingness and limited opportunities to engage with peers (Aristovnik *et al.*, 2020; Bessser *et al.*, 2020; Burns *et al.*, 2020; Zhai and Du, 2020). Additional challenges reported by students include concerns over their future professional careers and their ability to concentrate on their studies (Aristovnik *et al.*, 2020; Bessser *et al.*, 2020); daily routines that significantly changed due to learning online; feelings of anxiety, boredom and frustration (Aristovnik *et al.*, 2020); and challenges relating to the use of technology (Adedoyin & Soykan, 2020; Neupane, 2021).

The project reported in this study was created specifically for postgraduate Master's students, whose needs and challenges prior to the onset of the Covid-19 pandemic have been reported to be unique and different from those of other students. First and foremost, it has been widely reported in the literature that many of these students, particularly international students, face challenges and concerns in their adjustment to the academic expectations and conventions that are required from them at postgraduate study level, particularly critical and academic writing skills and the more active learning styles (Becker *et al.*, 2019; Bird, 2017; Coneyworth *et al.*, 2020; Kingston & Forland, 2008). Additionally, studies reported that postgraduate students in the UK often feel that they receive insufficient support for future employability (Arambewela & Maringe, 2012; Bird, 2017), and that often their needs for belonging and socialisation are overlooked (Coneyworth *et al.*, 2020). Specific to international students has been the challenge to adjust to the culture in the UK, which is often very distinct from their own (Bird, 2017; McDonald, 2014; Wu, 2015).

Research often reported that the support that universities provide their postgraduate students is insufficient and does not meet their unique needs and challenges (Arambewela & Maringe, 2012; Macleod *et al.*, 2019; McDonald, 2014). For example, one case study conducted by Arambewela and Maringe (2012), that explored postgraduate students' perception in a Russell Group university in the UK, found that the support services that the university provided tended to target domestic and undergraduate students, and did not meet the expectations or suit the demographics of many postgraduate students. For example, postgraduate students expressed their need for more relevant services to suit their studies, like targeted training in academic and critical writing and English language skills, as well as services preparing them for future career opportunities.

While the literature on the challenges faced by students in light of the Covid-19 pandemic is not specific to postgraduate students, it is plausible that the specific challenges often reported by postgraduate students have been amplified by the transition to online learning. Therefore, as discussed in the Introduction, the project reported in this paper aimed to provide support for students' academic and social needs. A focus group was conducted later to better understand students' experiences and needs in light of the Covid-19 pandemic and its challenges.

## Methodology

### *Methods and participants*

At end of the academic year 20/21, the two PGAs who co-led the project, conducted a focus group with five Master's students in the department, who attended at least one of the events offered through the project (see Table 1 for details of the participants). Four of the students were full-time international students, and one student was a flexible 'home' student. The students were asked about their perspectives on the events they attended, their possible explanations for the low uptake despite students' initial enthusiasm, and their suggestions for the future of the project. The focus group conversation was audio recorded and transcribed. The researchers adopted a thematic coding analysis (Robson & McCartan, 2016) strategy to analyse the findings and were guided by the research aims and questions. Initial codes were generated based on the participants' responses, and these were then gathered into themes which allowed for a more comprehensive understanding of the findings.

Participant	Mode of study	UK or international student	Events attended
S1	Flexible	UK	Predominantly drop-ins Viewed recordings of alumni talks
S2	Full-time	International	First alumni talk (about future studies) One writing retreat session Several drop-in sessions
S3	Full-time	International	Two drop-in sessions One writing retreat session One alumni talk
S4	Full-time	International	Several drop-in sessions
S5	Full-time	International	Several drop-in sessions (Viewed recording of the alumni talks)

**Table 1: Participants**

### *Research questions*

1. What were students' perspectives on the events they attended as part of the project?
2. Why was students' initial enthusiasm about the project not reflected in the participation?
3. What were students' suggestions for the future of the project?

## Findings

The findings are structured to answer the research questions.

### *Q1. What were students' perspectives on the events they attended as part of the project?*

Students valued the social dimension of the online events, and the informal spaces they created which provided them with opportunities to make social and professional connections with peers, that also helped alleviate stress regarding academic work and academic writing. The participants discussed the drop-in sessions more than other events, even though the alumni talks had the highest number of participants.

All participants attended at least two drop-in sessions. Four of the participants positively spoke about the drop-in sessions in their answers. The most recognised reason for the positive feedback on these sessions was the social dimension that was added to the Master's programme. The students perceived the drop-in sessions as an informal space to have conversations and make connections with peers, especially during the pandemic. Students who enrolled for face-to-face programmes could not have the in-person university experience due to the teaching and learning taking place entirely online. Students, therefore, did not have the opportunity to establish informal connections as they might have done face-to-face. For example, S2 mentioned that the social aspects were missing such as 'talking with other colleagues'. Likewise, S5 confirmed that it was the 'free talk' that she very much enjoyed. Furthermore, S5 mentioned the sessions to be informal as they had 'no set agenda or PPT slides', which S1 had also acknowledged,

It's been incredibly beneficial, especially during the pandemic, to have an informal space to have conversation, which isn't structured around necessarily the topics that we're studying, but just about how we're all feeling, ... just meeting people and understanding their backgrounds. (S1)

The students positively commented on the content included in the drop-in sessions. For instance, S3 revealed that she occasionally felt 'really anxious' as an international student who was unconfident in academic writing. Likewise, although S1 is a UK student, she shared the same 'mental stress' in academic writing,

So in some respects, the drop-in sessions that, [the project team] you guys held, was really helpful for that, because while you are just sitting at home creating this mental stress that, am I the only one trying to get these words done and can't do it? You know, how do I reference accurately? (S1)

S1 and S3 both found the drop-in sessions helpful as they could 'have a dialogue' (S1) with others about their anxieties. Moreover, S3 identified the challenge she was facing at that time regarding time management. She then referred to the positive aspect that she identified in one of the themed drop-in sessions in Term 3. That session was designed to focus on workload management, and thus, it helped her by 'discussing how to manage our time better' (S3). Therefore, it appears that the drop-in sessions helped students alleviate stress regarding academic work and academic writing for both UK and international students, particularly in an online learning context where students were isolated and lacked connection with peers.

Apart from the content about alleviating stress, students claimed that the drop-in sessions had a positive impact on their learning and professional development. S1 commented that the drop-in sessions helped her form professional connections with peers, as she could 'hear what's going on in the wider [professional] field'. S5 discussed the positive peer pressure that she felt during the sessions, which contributed to her motivation in learning,

Because I procrastinate, just keep postpone the time to finish a task, ... So when I join the session, and when I hear the things [students] have done, I feel stressed {laughs} and I push myself to learn more ... or some students ask questions and I can learn from others, I think that's the most important thing that I learned from the drop-in sessions. (S5)

Other benefits that participants acknowledged from attending the drop-in sessions include, 1) The students spoke positively of the fact that their timing was convenient since they alternated between 10 a.m. and 5 p.m. every fortnight. S1, as a part-time student who worked during the weekdays, acknowledged the convenience of having 5 p.m. sessions because she could join the sessions ‘after work hours’. The 10 a.m. sessions may have been more convenient for international students in different time zones. 2) For international students, the drop-in sessions in general appear to act as a platform to encourage conversations, which, as S3 commented, could ‘push them [international students] to jump out of their comfort zone, push them to talk and to share their views’.

In comparison to the drop-in sessions, the writing workshops and the alumni talks were not as popular. Two of five participants attended the writing workshops. S2 attended one session and reported that she found it beneficial for exchanging her work with other students. She reported that she did not attend other sessions due to time constraints. S3 also attended one session and reported that she faced challenges which stemmed from the design of the session: due to her struggles with academic writing, S3 found the schedule of the session was ‘a bit too quick’ for her, and that she chose not to attend others,

I can’t plan for my writing in [the first] 20 minutes or 30 minutes, so, it’s a little bit hard for me to follow the whole writing retreat, so I think it was better to just follow my own plan, so this is why I just attended once. (S3)

Two of the five participants attended one alumni talk and another participant watched their recordings. S2 reported the first alumni talk that she attended, which focused on future academic studies, to be ‘quite beneficial, considering I’m doing the postgraduate, it sort of guided me for the next steps.’ No one else spoke about the alumni talks, even though these events had the highest numbers of participants.

*Q2. Why was students’ initial enthusiasm about the project not reflected in the participation?*

While students initially expressed enthusiasm regarding the implementation of this project through the online survey, and while events in Term 2 saw an increased number of attendees as time went on, this enthusiasm did not last long. The number of attendees began to fall at the end of Term 2, and very few students attended the events in Term 3. This was recognised by S1 who said that ‘it’s just nice to have a little bit of dialogue and again it seemed to lessen as time went on’.

Participants identified some issues that might have resulted in the decrease in enthusiasm and participation. Firstly, the online remote learning was inevitably affected by time constraints and time differences. Like other international students, S2 felt ‘excited’ for many events but then ‘the time was not very suitable’. She further noted that, especially in the academic year of 20/21, when students had the choice of learning remotely from their home countries, ‘people were living in different areas, so it might not be convenient for everyone, due to time difference and so on’ (S2). A similar comment was made by S4. Moreover, S1, as a UK student, discussed the time differences in reference to people’s various commitments while working remotely, ‘everyone’s in different time zones, logistically ... for myself, I was working as well’.

Secondly, students reported to lack peer connection when learning remotely, and that resulted in students not having a sense of 'going together' to the events which might have lessened the participation in the project. Participants noted that most of the students had not met their peers in person or built relationships with them. S1 then described a scenario of obtaining peer support for participating in the events,

Most of us haven't really met our peers personally and built those relationships, and often when you do that, you can have a group saying, 'oh, look, are you going to turn up to this?' and 'this will be really interesting', and you can kind of drum up a little bit more of the number work. (S1)

Thirdly, all participants confirmed the general decrease in enthusiasm over the year, as well as a virtual and general fatigue, which might have also impacted their participation in the project. S5 described the 'huge differences in the atmosphere' that she had felt from Term 1 to Term 3:

In Term 1, I feel very enthusiastic and very joyful to participate in each tutorial, drop-in session, any activity organised by the [university] or by [the project team] (S5)

In comparison, she found that she did not enjoy participating as much in live tutorials in Terms 2 and 3.

For a person who wants to keep joining events, ... you have to keep joining, and they need to have passion, they're passionate and enthusiastic, but when it comes to Term 2 it kind of shut down, you know, my feeling about learning kind of calmed down, and so, that's why when I joined a drop-in session every time, ... the feeling of participation is not very high. (S5)

Similarly, S3 and S4 noted that students' decreased interest in various activities had become more substantial as the year went on; 'maybe some of them just not interested and only wanted to study or something' (S4). In addition to the general fatigue over the year, S1 highlighted the 'digital fatigue' during this year of online learning, which she described as an 'unfortunate circumstance with regards to the current era that we're living through',

Predominantly, I think it probably is just due to the fact that there's a virtual fatigue during the pandemic period. ... so I think there is a bit of a digital fatigue that has set in, when you're back on your computer again, back to, kind of, listening to something. (S1)

It appears that this 'digital fatigue' might have therefore affected the efficiency of methods for reaching students and notifying them about the events. The project team had advertised the events by posting on the online teaching and learning platform used across the university, where students could access all the learning materials and activities. Students registered on the programme received an email every time a post was made. As S4 mentioned,

Every time we receive emails that notice us to participate, I find that every day there are so many emails that sometimes I ignore them. (S4)

Therefore, the students might have received too many emails from the same platform and therefore chosen to not engage with them. Thus, this method of reaching students might have



not been efficient. As mentioned before, although the project team initially set up an alternative online space for students only, the space was not picked up by the students. The project team had therefore stopped using that online space.

The final reason for the initial enthusiasm not being reflected in participation was suggested to be language barriers for international students. Again, because international students in the academic year of 20/21 had the choice of learning remotely from their home countries, those who made this choice might not have had many opportunities to practise their English-speaking skills as they would have if they had been in the UK. This may have resulted in a general lack of confidence in speaking English. International students, as non-native English speakers, had accounted for the majority of the cohort. S3, as one of them, said that students from her country can often be shy and struggle to talk with others in English. For example, S3 mentioned that she used to invite her friend to join her in attending activities but was rejected,

I always try to ask one of my friends, ‘hey, come with me, let’s go together’ but she’s there, like, ‘no, I don’t want to talk’, she’s not get used to talk in English, so I think, maybe this is also one of the biggest problems, we lack the language environment, some people, they lack the courage, they don’t want to jump out of their comfort zone to talk with others in English. (S3)

### *Q3. What were students’ suggestions for the future of the project?*

The participants all agreed that it may be beneficial to implement this pilot project as a regular social project in the department in the future. They acknowledged the value of online activities and experiences, and suggested that the future of the project can balance online and offline activities. They further proposed that the project might benefit from creating a wider community, for instance, involving more students from other Master’s programmes to both attend the activities and be involved in the project team. Interestingly, engaging a large number of Master’s students, as part of the idea of a wider community, was one of the aspirations of the project at its outset.

All five participants suggested a combination of online and offline activities for the future of the project, while one of them suggested that the balance should shift more towards online activities, since they can allow more flexibility for the participants. Four participants suggested that a balance of online and offline would be helpful for students with diverse needs. For example, S1 acknowledged that due to students from different formats,

I think moving forward it’d be nice to have a balance of both, obviously, understandably for a Master’s programme, there are so many different students coming in from different formats – part-time, flexi, online and so on. So I think, definitely a balance of both would be quite helpful. For example, the drop-in one would be nice to have some face-to-face, and it’s understandable if the other ones need to be virtual as well, so I guess it’s just gathering up your numbers to see who can attend what. (S1)

Those suggestions were in line with the aim of the project, which was to work together to enhance the learning experiences of students, by seeking students’ voices, and responding to them in partnership with the students.

Furthermore, while the participants suggested a combination of online and offline activities, they recognised the benefits of online activities. Firstly, they proposed that online activities would be convenient for those who were not on campus, who would either have no access to campus if the circumstances continued, or might have in-person experience already and ‘sometimes they just want to attend a session wherever they are’ (S2). Secondly, S4 and S1 found it beneficial to have the option of watching a recording of an online event, either as a solution to time constraints, or for those who wanted to watch the event more than once. S3 highlighted the flexibility of online participation, and therefore thought online communication may be better.

Participants further suggested the building of a wider community in the future, which can involve students from other programmes in the department. S1 said that the project should ‘definitely evolve’ if moving forward, and then proposed reaching to students from different modules and programmes,

... get more people involved, like potentially people from different modules and so on, it’d be nice to have different experiences. [The project team] can as well delegate the whole process a little bit, and have a bit of wider community, so like perhaps a ‘project group’ can come together and suggest more different ideas and you can have more students on there to suggest and people from different countries, so you can have flexi, online, part-time, you can actually cater for the masses, so that will be quite helpful. (S1)

According to S1, after involving more students, the project team can delegate the process by, for instance, establishing a group of students who can co-lead the project and propose various ideas. This group can then represent students from different countries and modes of attendance. This suggestion again reflected on the aim of the project, seeking to understand students’ needs, and responding to them in partnership with the students.

## Conclusions

This study concludes that despite the initial enthusiasm (the ‘romance’) for the project from both the project team and students, different factors seem to have resulted in the low uptake throughout the project, including: time difference and time constraints; lacking a sense of peer connection; general and digital fatigue from online learning; and language barriers for international students. Students appeared to value the social dimension that the project added to their general Master’s experience; however, it did not seem to contribute to the peer connections that students lacked while learning online.

Lessons learnt from our project, as well as additional studies and reviews conducted in the context of the Covid-19 pandemic, demonstrate the importance of diversifying online activities and services in higher education institutions, in order to cater for the needs of a greater number of students (Adedoyin & Soykan, 2020; Burns *et al.*, 2020). We have found that, in order to increase student engagement and satisfaction in our online project, awareness of the diversity in student demographics, interests and needs was paramount. Thus, online programmes and projects can be designed in ways that reflect on the flexibility of online learning (Stone *et al.*, 2019). For example, various methods should be used to reach students, and a variety of activities should be held on different platforms and at different times of the day, to ensure different students’ ability to access. Moreover, forming partnerships with student representatives can help encourage students’ engagement and seek students’ feedback

on the programmes. Additionally, we have also found that sometimes, less is more. The most successful events – the drop-in sessions - were less structured and did not have a clear focus or agenda; rather, they provided informal spaces for students to form friendships with their colleagues and have casual conversations while learning remotely. This reflects on one of the essential elements of online community: building personal connections (Singh & Thurman, 2019; Burke *et al.*, 2021).

The limitations of this study might be rooted in the roles of the two PGTAs in the Master's programmes, who also acted as the project leaders. The duality of these roles may have benefitted the project since the students from the Master's programmes had more opportunities to familiarise themselves with the project team and establish connections them, and vice versa. However, these dual roles raised concerns over the ethical issues that students may not have been entirely honest because: a) the project teams are staff members, b) the students might not want to give feedback that might offend the project team who also conducted the interviews. Additionally, the project team worked with only two Master's programme in the department, and that might become a barrier that stopped students in other programmes from participating in the events.

This study offers valuable insights into the perceptions of Master's students' learning experiences, and their needs and expectations during online learning within the COVID-19 context. This study can be significant for academic staff who wish to understand students' needs in an online context, and support them through the implementation of a peer support framework.

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***Implementation of an Efficient Strategy to Analyse the Mathematical Training Required in Undergraduate Degrees in Engineering and Architecture***

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**Abstract**

Engineering and Architecture studies aim to develop professionals capable of facing and solving complex multidisciplinary problems. This requires abilities that cannot be acquired without a comprehensive training model, addressing real-world problems to provide technical solutions. Furthermore, it is necessary to ensure the acquisition of skills to generalise and think abstractly about reality. For this purpose, fundamental disciplines training, such as mathematics, play a relevant role in technical undergraduate studies and their corresponding contents and temporal order traineeship should be properly analysed when designing their curricula. This work describes an active and collaborative methodology used to analyse the mathematical concepts and tools that should be introduced in the undergraduate degrees in the School of Engineering and Architecture at the University of Zaragoza. The methodology applied is based on the activation of communication mechanisms between the teaching staff of mathematical subjects and those of higher courses, in which the students acquire the specific skills of each degree. Moreover, it has motivated interesting discussions between mathematics teaching staff. As a result, a great deal of information has been gathered about the mathematical knowledge required, and its appropriate scheduling, in all degree programs. Also, some deficiencies that should be addressed in the initial training have been identified. Finally, a strategy has been planned for contextualising the mathematical training in different disciplines to help students to understand the relevance of mathematics formation and motivate them in their study.

**Keywords:** Mathematics, Engineering and Architecture, University Curriculum Design, Multidisciplinarity

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## Introduction

The School of Engineering and Architecture (the School) is one of the largest teaching centres at the University of Zaragoza. It has more than 5000 students, 670 professors, 140 administration and services professionals and offers a total of 9 undergraduate degrees (eight degrees in Engineering and a degree in Architecture Studies), 11 university master degrees and several courses oriented to life-long learning.

With the goal set on training the best students, increasing their capabilities, skills and talent, the School promotes the highest quality standards within a national and international framework. It is a national benchmark in terms of its Quality Management System. In fact, it has been the first Spanish Engineering and Architecture school to achieve the AUDIT certificate by ANECA, the Spanish Agency for Quality Assessment and Accreditation. Nowadays, four of its undergraduate degrees have obtained the European quality stamp EUR-ACE certifying high-quality engineering degree programs in Europe and abroad. The School also pays special attention to continuous improvement and quality assurance in all its degrees, providing professionals that can be integrated into a globalised and highly competitive world.

Increasing data and information in today's society represents a major challenge to multidisciplinary knowledge. In order to set reference points and knowledge relationships, it becomes necessary to establish links between different knowledge areas (Solorzano Movilla et al., 2017). In this context, the study carried out by Serres Voisin et al. (2012) indicates that in undergraduate studies in Engineering and Architecture, mathematics is a tool, rather than a purpose. However, during the last years, some teachers at the School, not only involved in mathematical training, are warning against the lack of mathematical knowledge necessary for the correct follow-up of the subjects in which students must acquire the specific skills of the corresponding curriculum. Sometimes, teachers have to use a portion of the time allotted to specialised subjects for the introduction of the necessary mathematical tools. Consequently, the specific formation at these subjects or the time available to achieve the corresponding learning objectives is reduced.

Therefore, it is very important to precisely identify which mathematical concepts and tools are essential for students to get specific skills in the corresponding study plans. At the same time, it is convenient to establish the most appropriate time frame to acquire this mathematical knowledge, or the ordering and level in which it should be introduced. In this sense, Ooi (2007) discusses the design of mathematics subjects in engineering undergraduate curricula. Different variables, such as the coexistence of mathematical learning with other more technical subjects or the type of mathematics that the future engineer will need, are considered in that analysis.

Conventional teaching in highly practical careers poses difficulties for students because of the large theoretical load and the disconnection of the learned tools and their subsequent application. For this reason, collaborative interdisciplinary learning and teaching methodologies should be integrated (Muñoz La Rivera et al., 2018). A recent review of Pepin et al. (2021) gathers significant ongoing international research on innovative mathematics teaching and learning practices in Engineering degrees. In particular, they analyse promising innovations in mathematics learning procedures and their implications for engineering curriculum reform.



The establishment of the European Higher Education Area (EHEA) involved a restructuring of higher university education. At all the School undergraduate degrees, it led to a concentration of the mathematical teaching and a reduction of the number of mathematical subjects, giving rise to a considerable shortening in the available time for the mathematical training. It should be stressed that this was not the case in other Spanish universities, such as the University Polytechnic of Catalonia, the University Polytechnic of Valencia, the University Polytechnic of Madrid, the University Polytechnic of Cartagena, the University Carlos III or the University of the Basque Country. In fact, the universities of Zaragoza and Cadiz are the Spanish universities with the lowest number of credits in engineering degrees for mathematical training.

Currently, a new Spanish high studies normative (here in after RD 822/2021) establishes the organisation of university education and its quality assurance procedures. It is based on the experience accumulated through the implementation of the EHEA in the Spanish higher education institutions. With the aim of facilitating university graduates a dignified and qualified job, its goal is to strengthen the employability capabilities conferred by the training received in different degrees, based on the skills and knowledge assumed. According to RD 822/2021, the general principles that should inspire the design of the curricula of university degrees are the following:

- a) The academic rigour of the training project implicit in higher education;
- b) The concordance with the generalist or specialised aspect of the cycles in which the teaching is inscribed;
- c) The coherence between the learning objectives of the curriculum, the fundamental competencies that are pursued and the established student learning assessment systems;
- d) Its social understanding.

Under these considerations, the aforementioned RD 822/2021 provides an excellent opportunity for adapting the degrees of the Spanish Universities to the current needs of society. In the School, the necessary cogitation to identify improvement and upgrading aspects in Engineering and Architecture diplomas at the University of Zaragoza has begun. In this context, the authors have participated in a Centre Strategic Innovation Project (CSIP) to determine the learning outcomes to be obtained by students in mathematical subjects, as a necessary tool in subsequent technological subjects. The performed analysis is similar to that of a complete curriculum versus future work in a company (Fitzpatrick et al., 2009).

In other similar studies, the perceptions of a sample of students regarding the relevance of different learning outcomes obtained in different subjects were collected (Arias-Rueda et al., 2017 and Castro et al. 2008). However, to achieve our objective, effective channels of communication among teachers have also been identified as necessary (Yeomans and Atrens, 2001 and Walkington, 2002). Furthermore, as it is going to be explained, the adopted strategy will facilitate the contextualization of the teaching in the mathematical subjects offered in the study plan of all the undergraduate degrees of the School.

In order to describe the mathematical prerequisites expected for new undergraduate students in STEM, Deeken et al. (2020) carried out a Delphi study with German university professors of first term mathematics courses. This research consisted of an iteration of expert surveys that provided feedback to the participants after each survey round. In contrast, in this work we describe a different strategy, which is based on an active and collaborative methodology

aiming to highlight the mathematical knowledge needed in the technical disciplines of higher courses and to activate communication mechanisms between teachers of mathematical and technological subjects. In Section 2, we describe the strategy followed along the CSIP. The experience of its application and the main results are analysed in Section 3, and finally a Conclusions section closes the paper.

## Methodology

In this section, we describe the strategy followed within the CSIP for the analysis and dissemination of the mathematical training required for the acquisition of specific Engineering and Architecture skills. The CSIP members are part of the teaching staff of different knowledge areas in the School, not only those related to mathematics. This diversity in the training profile of its components has facilitated and enriched the design and implementation of working methodologies, as well as the analysis and dissemination of results. The work has been organised into four phases or stages (see Figure 1):

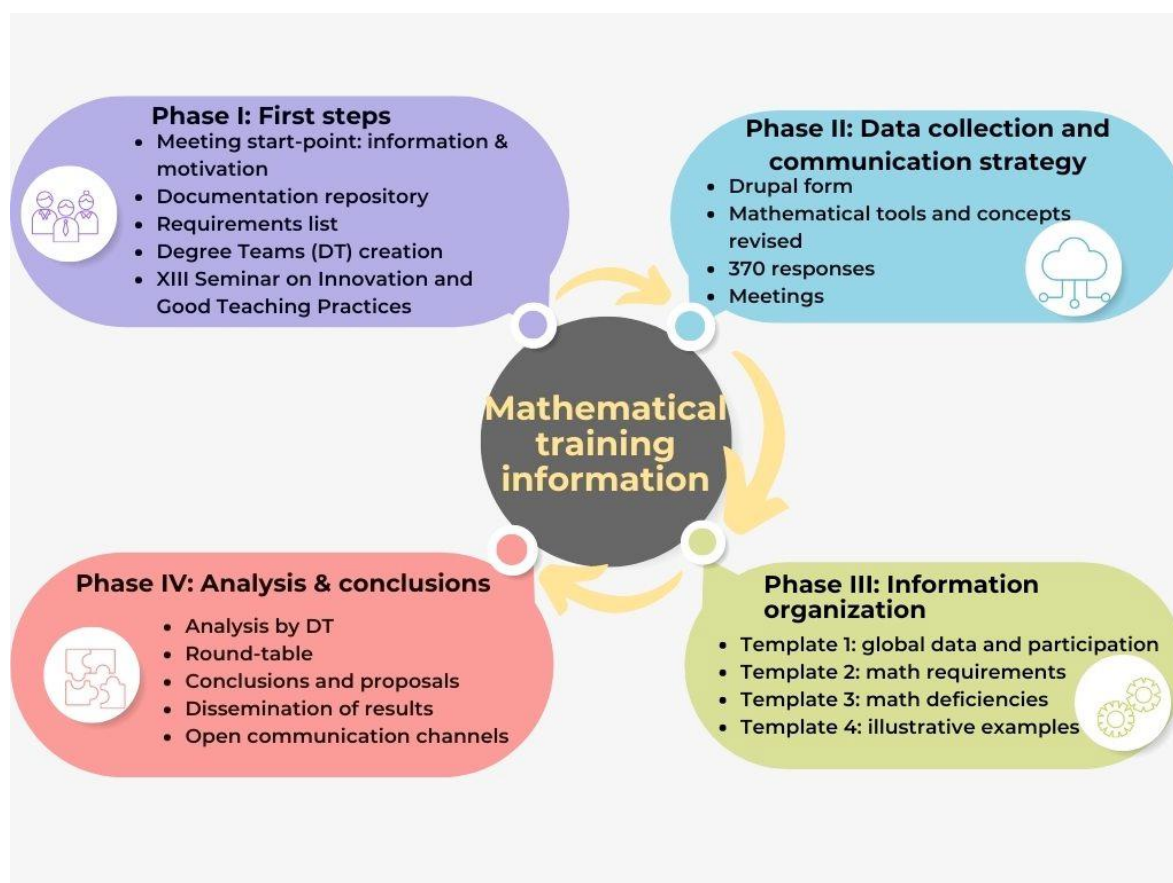


Figure 1: Sketch of the proposed methodology.

### Phase I: First steps and dissemination of the innovation project objectives.

At a first step, the project components held a series of meetings to share concerns that prompted their participation. During these sessions, a comprehensive approach and some methodological aspects were set up. In addition, degree teams (DT) were established for the organization of the tasks. During this period, a virtual platform (Moodle: <https://moodle.unizar.es/add/>) was created as a repository for documentation and efficient communication tool among project members. All the meetings were very rewarding, in

particular due to the exchange of ideas and impressions among professors of mathematics and other subjects. In order to establish efficient communication channels allowing a constant flow of accurate information, the convenience of unifying the nomenclature to refer to mathematical tools was highlighted.

The most important goals of the CSIP, as well as those related to its methodology, were presented at the XIII Seminar on Innovation and Good Teaching Practices (see [https://eina.unizar.es/sites/eina.unizar.es/files/archivos/Calidad/innovaciondocente/xiii\\_seminario\\_innovacion\\_eina.pdf](https://eina.unizar.es/sites/eina.unizar.es/files/archivos/Calidad/innovaciondocente/xiii_seminario_innovacion_eina.pdf)). This presentation sparked interest of other professors who joined the project.

## **Phase II: Design of the data collection and communication strategy.**

At this stage, a Drupal form was elaborated to gather information. Its link was sent to the professors of all degrees of the School, asking for identified mathematical requirements for the subjects, as well as gaps they are finding during their teaching (see <https://eina.unizar.es/requisitos-matematicos-requeridos-para-la-adquisicion-de-las-competencias-especificas>).

In order to design the collection data form, a list of 36 mathematical topics and tools were established. During the last few years, some teachers of the School are pointing out that the mathematical training of the newly arrived students is increasingly poor. So, some mathematical concepts and tools from pre-university studies were also incorporated. The list was reviewed by all project members to ensure that it was complete, understandable and balanced between enough detail and not excessive length. The option to specify that a subject does not require any mathematical background was also included. Finally, teachers could also refer to not listed identified requirements or gaps and indicate the availability of simple exercises in the context of their subjects, related with the listed requirements.

The link to the form was sent to the coordinators of the nine degrees of the School, requesting its distribution among the corresponding degree professors. The link was accompanied by an email highlighting that the aim of the project was to provide students with the opportunity to acquire the specific skills of the corresponding curriculum. It was also announced that, once the information had been analyzed, a meeting would be scheduled to share the conclusions and to discuss possible needs and opportunities for improvement.

All submitted information was automatically downloaded into an Excel spreadsheet.

## **Phase III: Organization of the information collected.**

During this phase, the project focused on defining an efficient strategy to organise the vast amount of information gathered. In order to analyse, illustrate and draw conclusions, four templates were designed.

*Template 1* was devoted to processing general information for each degree, in terms of percentages of received responses per course and per semester, percentages of subjects that do not require mathematical training and, finally, percentages of subjects in which some gaps or deficiencies had been detected. This template also included the list of subjects for which a response to the form had or had not been received.

*Template 2* was devoted to processing the information collected on mathematical requirements by subject and semester. A table was included in the model with columns representing the various semesters of the curriculum ( $S_j$ ,  $j=1, \dots, 8$ , for the Engineering degrees and  $S_j$ ,  $j=1, \dots, 10$ , for the Architecture Studies degree). The rows were aligned with the different requirements. In particular, the first row was reserved for subjects with no mathematical requirements. The following rows matched the requirements ( $R_i$ ,  $i=1, \dots, 36$ ) included in the form. Note that, in many cases, several  $R_{ik}$  rows were needed for the same requirement  $R_i$ . In the cell ( $R_{ik}, S_j$ ), the administrative code of the subject  $k$  in semester  $S_j$ , in which requirement  $R_i$  had been indicated, was introduced. Finally, the last rows contained those requirements that had been additionally stated in the answers to the form by the teachers. This kind of information representation made the temporal analysis of mathematical requirements easier in all the degrees.

*Template 3* was devoted to processing information on detected mathematical deficiencies and analysing their possible causes. A table similar to template 2 was created. Its rows and columns indicated the unacquired requirements  $R_i$  and the semesters  $S_j$ , respectively. However, in each cell ( $R_{ik}, S_j$ ) the code of the subjects was accompanied by a key (1, 2 or 3) encoding the reason for the reported deficiency:

- Key = 1 meant that  $R_i$  had been explained but forgotten,
- Key = 2 meant that  $R_i$  was not included in the study plan,
- Key = 3 meant that  $R_i$  was introduced and studied later in the study plan.

The maths teachers of the DT settled these keys by reviewing the content of the degree subjects.

*Template 4* was devoted to elaborating the list of professors indicating the availability of simple examples for the illustration of the utility of a requirement  $R_i$ . In this template, a table was also created to show in each row the information concerning the teaching staff and the corresponding subject: name, email, knowledge area, subject administrative code, subject name, degree, course and semester. In the next columns, rows showed all the mathematical requirements  $R_i$  identified by the teachers. All this information was easily obtained from the Excel spreadsheet provided by the Drupal form. Finally, in the last columns, some information tracking was also introduced: teacher contacted (yes or no / person who has contacted), permission to use the material provided by the teacher (yes or no), received material (yes or no).

From the information collected in the Drupal form, each DT filled out the four above-mentioned templates.

#### **Phase IV: Analysis of the information and preliminary conclusions.**

In this phase, each DT analysed the data collected in the form (phase II) and organised it in the templates (phase III). Subsequently, all DT's analysis were shared and discussed in a round table. A report format document was designed to capture conclusions in all the degrees.

In addition to these conclusions, some proposals for improving the corresponding degrees curriculum were suggested. In this sense, some non-required mathematical concepts were detected. In some subjects, some changes in the temporal order of the teaching were proposed

for the refinement of the sequencing of contents. Furthermore, it was also considered a possible inclusion of more mathematical credits to accomplish the identified deficiencies in some degrees.

An important goal of the project was to enable communication mechanisms between mathematicians and non-mathematicians teachers. For this reason, a meeting with the whole teaching staff of each degree was scheduled. Using template 4, a personalised invitation was sent to the teachers who had indicated the availability of simple examples to illustrate the use of mathematical tools in the context of their subjects. During these meetings, each DT presented the conducted analysis, as well as the conclusions drawn, explaining the appropriate format of the requested examples in order to make them as useful as possible. Finally, a time period was established to ask for clarifications, provide new information and nuance some conclusions. In this way, an interesting communication channel was initiated. It will be maintained over time while serving as a triangulation instrument, adding more rigour to the research carried out (Rodríguez et al., 1996).

### **Experience and results**

The initial number of project members was 24 and after the first meetings (Phase I) 2 more professors joined the project. In particular, 14 participants were involved in mathematical teaching and 12 in non-mathematical teaching. At Phase II, 36 mathematical requirements were listed in the form: 3 corresponding to mathematical knowledge that should be acquired before university, 8 from Calculus, 5 from Differential Equations, 9 from Algebra and, 7 from numerical methods, finally, 4 from Statistics and Optimization.

The form was available for two weeks and was sent to all the School's faculty. A total of 370 responses were received. Table 1 displays, for each degree, the total numbers of subjects and semesters of the corresponding study plan, as well as information collected in Template 1: the numbers of received responses, subjects with provided information (sometimes, professors in different teaching groups sent information of the same subject) and, finally, subjects reporting no maths requirements. Table 1 highlights this information in light pink.

<i>Degree in</i>	# Subjects	# Sem.	# Responses	# Subjects with info (%)	# Subjects with no requirements reported
Architecture studies	50	10	30	29 (55%)	8
Chemical Eng.	41	8	50	38 (92.6%)	4
Computer Eng.	63	8	52	47 (74.6%)	16
Electrical Eng.	42	8	31	28 (66.7%)	0
Electronic and Automatic Eng.	43	8	34	28 (65.1%)	0
Industrial Design Eng. and Product Development	52	8	36	32 (61.5%)	16
Industrial Technology Eng.	53	8	62	38 (71.7%)	1
Mechanical Eng.	51	8	35	32 (62.7%)	1
Telecommunication and Services Eng.	60	8	40	37 (61.7%)	1
<b>Total</b>	<b>455</b>	<b>8 or 10</b>	<b>370</b>	<b>309 (68%)</b>	<b>47</b>

Table 1: General information and collected data about degree subjects (Template 1).

Analysing Table 1, significant differences on the participation in the different degrees can be observed. Figure 2 displays the number and percentage of responses collected in each degree over the absolute number of collected responses. Let us observe that the Industrial Technology Engineering degree provides the greatest number of responses, 16.8% of the data collected. On the contrary, the degree in Architecture studies only supposes an 8.1% of the data.

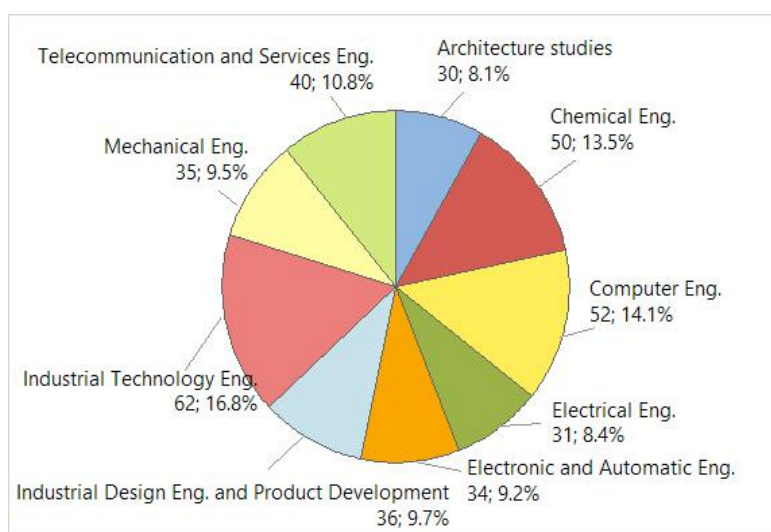


Figure 2: Number of responses and percentage of participation per degree.

A temporary participation analysis is shown in Figure 3, where the total number of responses for all the subjects at each semester is represented. The number of responses collected in semesters 9 and 10 corresponds to the degree in Architecture studies, which is the unique degree with 10 semesters instead of 8, as all the others. For this reason, from now on, only information of the first 8 semesters will be considered in order to simplify the illustration of the performed analysis.

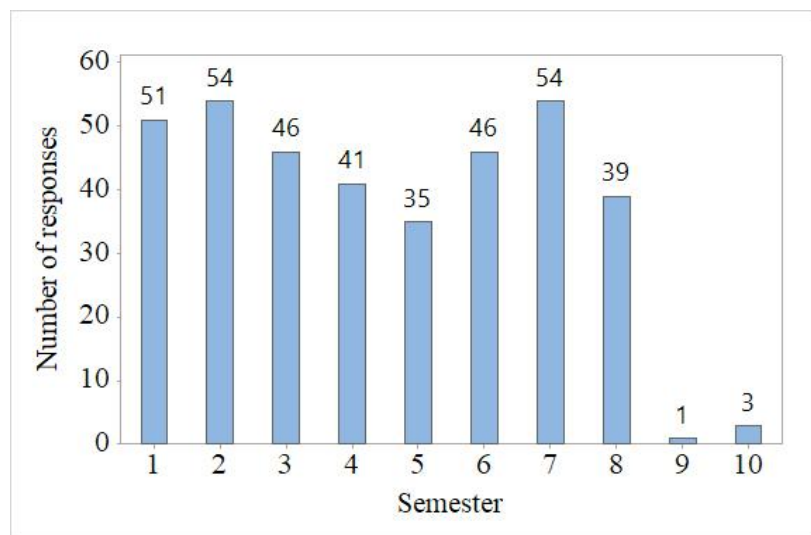


Figure 3: Total number of collected responses in each semester.

Next, Figure 4 illustrates, for each degree and semester, the percentage of subjects in which at least a response to the form has been received. The red line provides a reference at 50%. It can be easily checked that, in all the degrees, a response rate over 50% has been obtained in almost all semesters. Let us also observe that semester 8 presents the lowest participation rate. This coincides with the fact that, mainly, optative subjects and the final undergraduate project are offered to students in this semester.

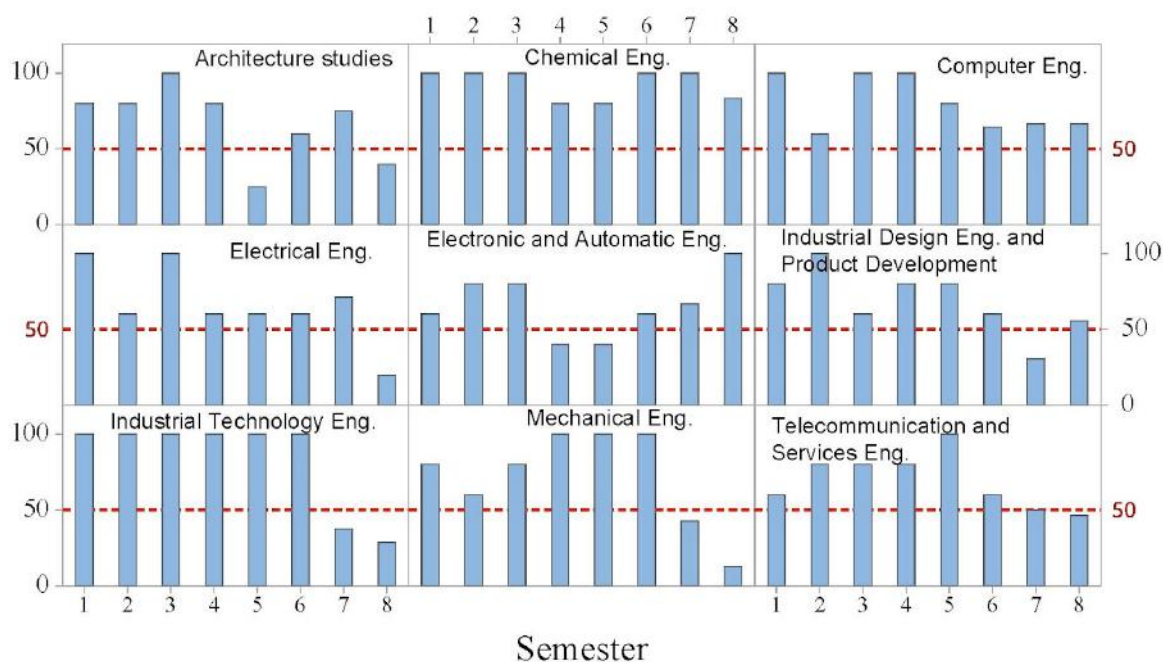


Figure 4: Percentage of subjects with at least a response per semester and degree.



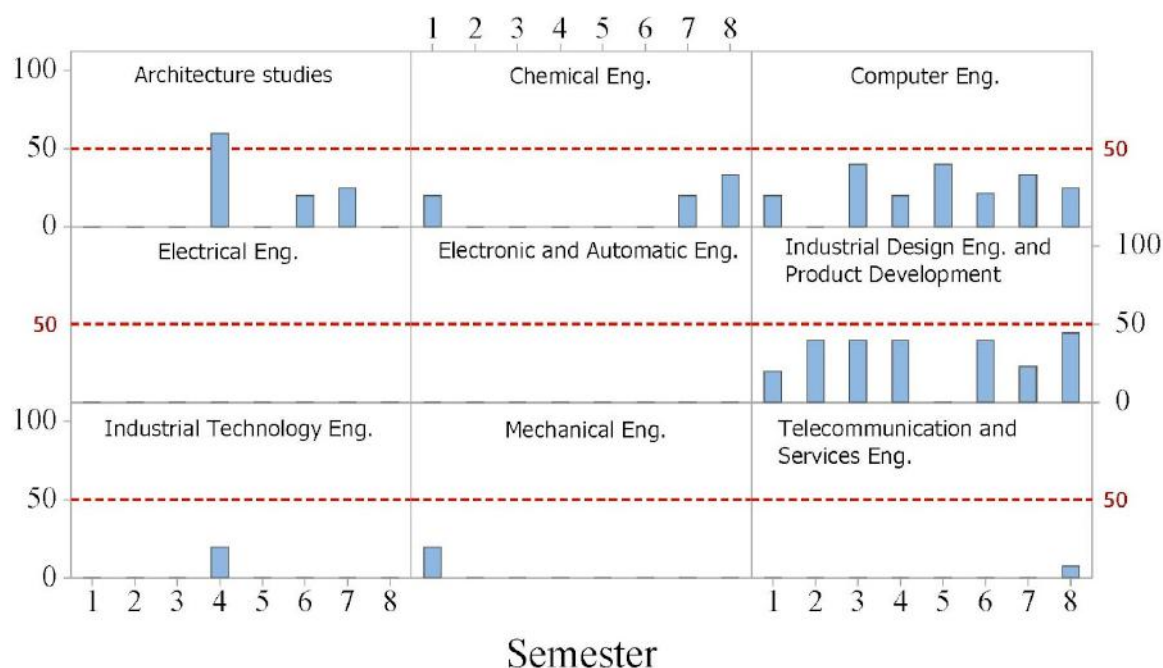


Figure 5: Percentage of subjects with no mathematical needs reported per semester and degree.

Figures 5 and 6 provide detailed information on the number and the percentage of subjects for which no mathematical needs have been reported. As illustrated in Table 1, there are 47 over 309 subjects with response. The pie chart in Figure 6 compares among degrees the corresponding number and percentage in the total set of 47 subjects. It can be observed that 85% of these subjects are distributed in only three degrees: in Industrial Design Engineering and Product Development, in Computer Engineering and in Architecture Studies. For the rest of degrees, the corresponding percentage is very low. In fact, in Figure 5 we can check that there are two degrees (in Electrical and in Electronic and Automatic Engineering) in which at least a response has been received requiring mathematical knowledge in all the subjects, so they do not appear in Figure 6.

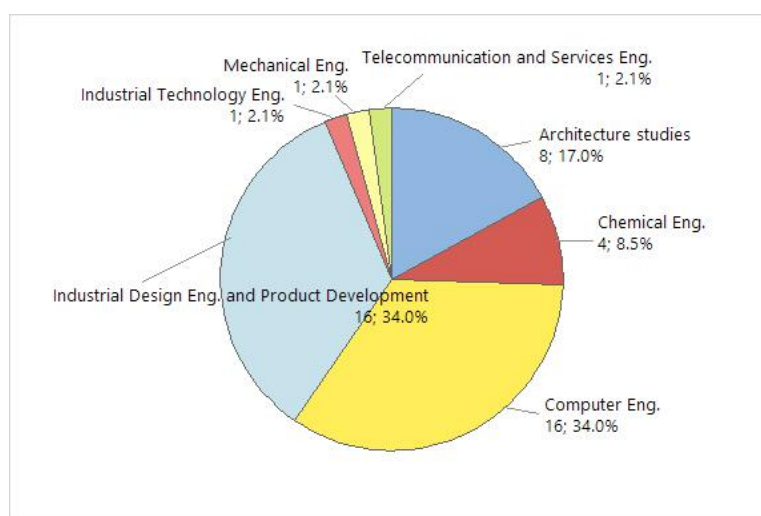


Figure 6: Number and percentage of subjects with no mathematical needs reported.



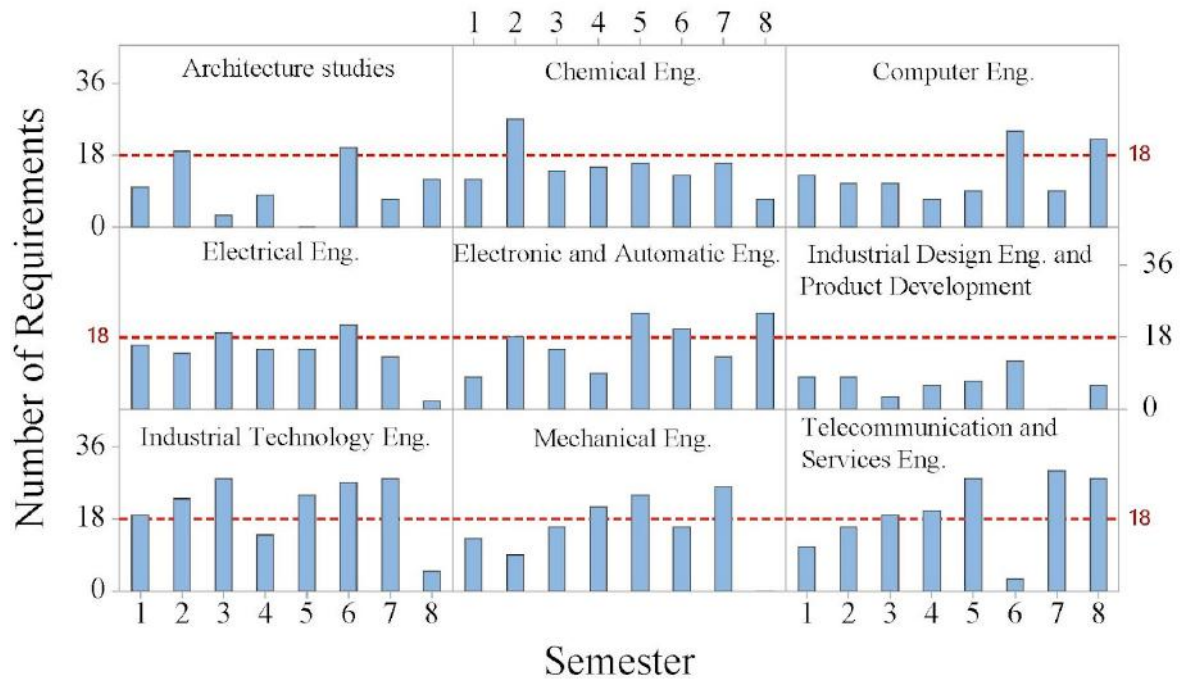


Figure 7: Number of mathematical requirements for each degree and semester.

Figure 7 shows in each degree, for each semester, the number of mathematical requirements out of the total set of 36 requirements. Those requirements that were reported in more than one subject have been considered only once. Furthermore, Figure 8 shows the number of requirements per semester counted as many times as they have been reported in the forms related to each semester. For instance, the maximum is achieved in semester 7 of the degree Telecommunication and Services Engineering, in which a total of 96 mathematical requirements were marked among the forms corresponding to the 19 subjects implied in this semester.

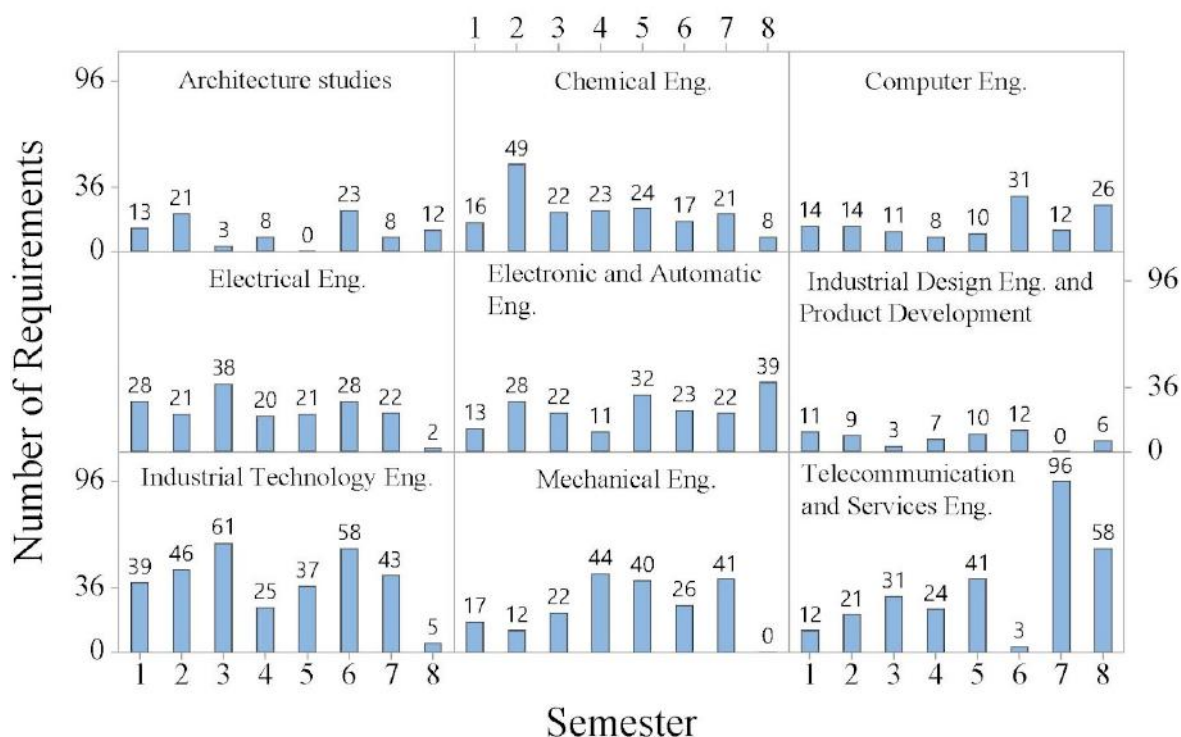


Figure 8: Number of the mathematical requirements (counting repetitions) for each degree and semester.

A similar representation is shown in Figures 9 and 10 to analyse the number of mathematical deficiencies reported. From the total set of 309 subjects with at least one response to the form, some deficiencies are detected in 119 subjects. As it can be seen in Figure 9, deficiencies are usually detected in subjects in the first years of the program. Let us observe that mathematical gaps have been reported for more than a half of the subjects in five (of eight) semesters of the degree in Industrial Technology Engineering.

It is also observed that even the degrees that previously had fewer requirements have detected deficiencies in Mathematics. A reason may be that the subjects that did mark mathematical requirements also detected deficiencies in those requirements. This is not as surprising as it may seem, since the mathematical training in the degrees in Architecture Studies and in Industrial Design and Product Development Engineering is less than in the rest of the degrees of the School. On the other hand, in the Telecommunications Services Engineering degree, from the fourth semester onwards, no deficiencies are detected. It should be noted that the study plan of this degree provides 6 more credits than the rest of the degrees in Engineering. This fact can explain that in the distribution of the 119 subjects in the degrees displayed in Figure 10, only 5.9% of the subjects correspond to Telecommunications Services Engineering degree.

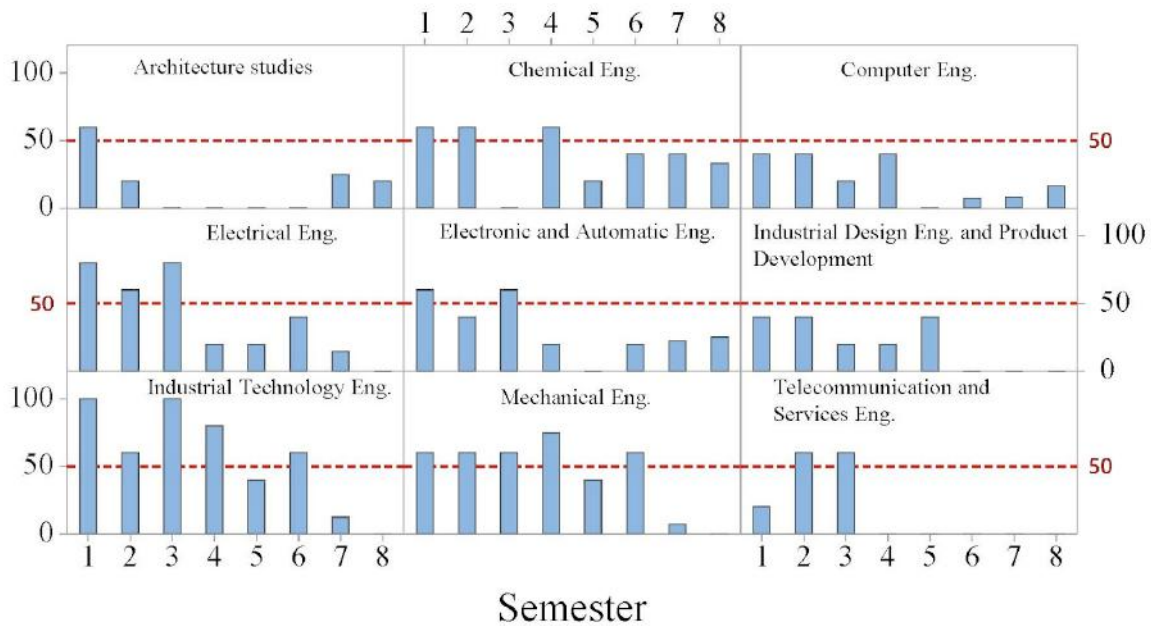


Figure 9: Percentage of subjects with mathematical deficiencies detected per semester and degree.

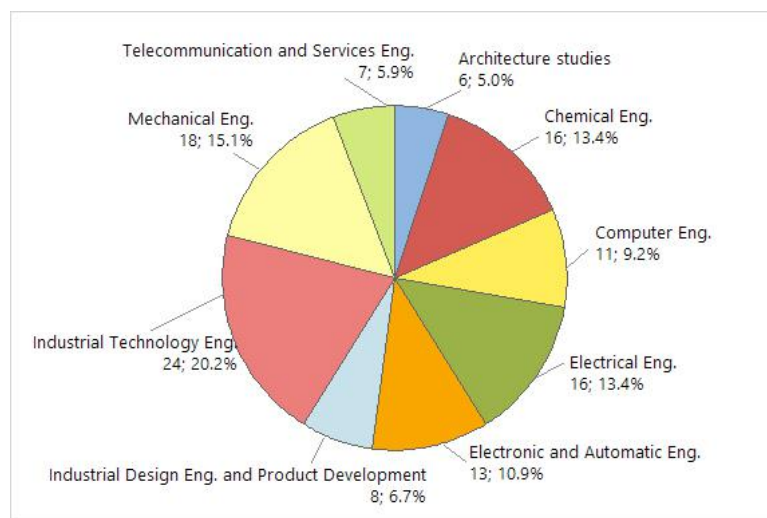


Figure 10: Number and percentage of subjects with mathematical deficiencies detected.

On the other hand, Figures 11 and 12 illustrate, for each degree, the frequency of each requirement and deficiency, respectively, that is, the number of times (counting repetitions) they have been reported in the different subjects of the degree. In these figures, degrees have been denoted by  $D_i$ ,  $i=1, \dots, 9$ , and identified by colours. Moreover, Rows  $R_j$  and  $DF_j$ ,  $j=1, \dots, 36$ , identify the listed requirements and those reported as deficiencies, respectively. Let us notice that they have been listed by knowledge groups. The sum of the frequencies for all requirements and degrees is 1638. As far as deficiencies are concerned, the sum of the frequencies is 291.

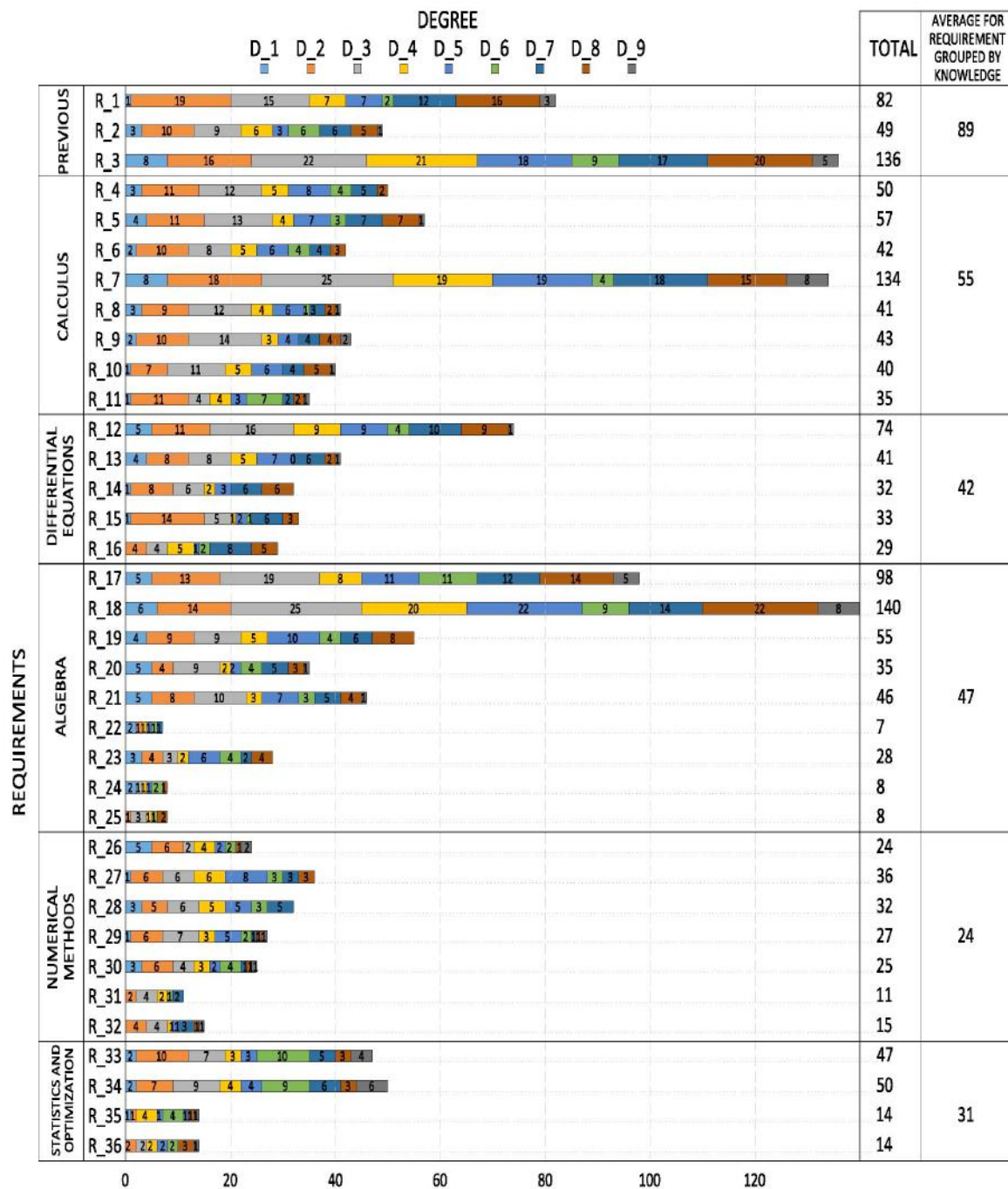


Figure 11: Mathematical requirements for degree (D\_1: Architecture studies, D\_2: Telecommunications and Services Engineering, D\_3: Industrial Technology Engineering, D\_4: Chemical Engineering, D\_5: Mechanical Engineering, D\_6: Computer Engineering, D\_7: Electronic and Automatic Engineering, D\_8: Electrical Engineering, D\_9: Industrial Design Engineering and Product Development).

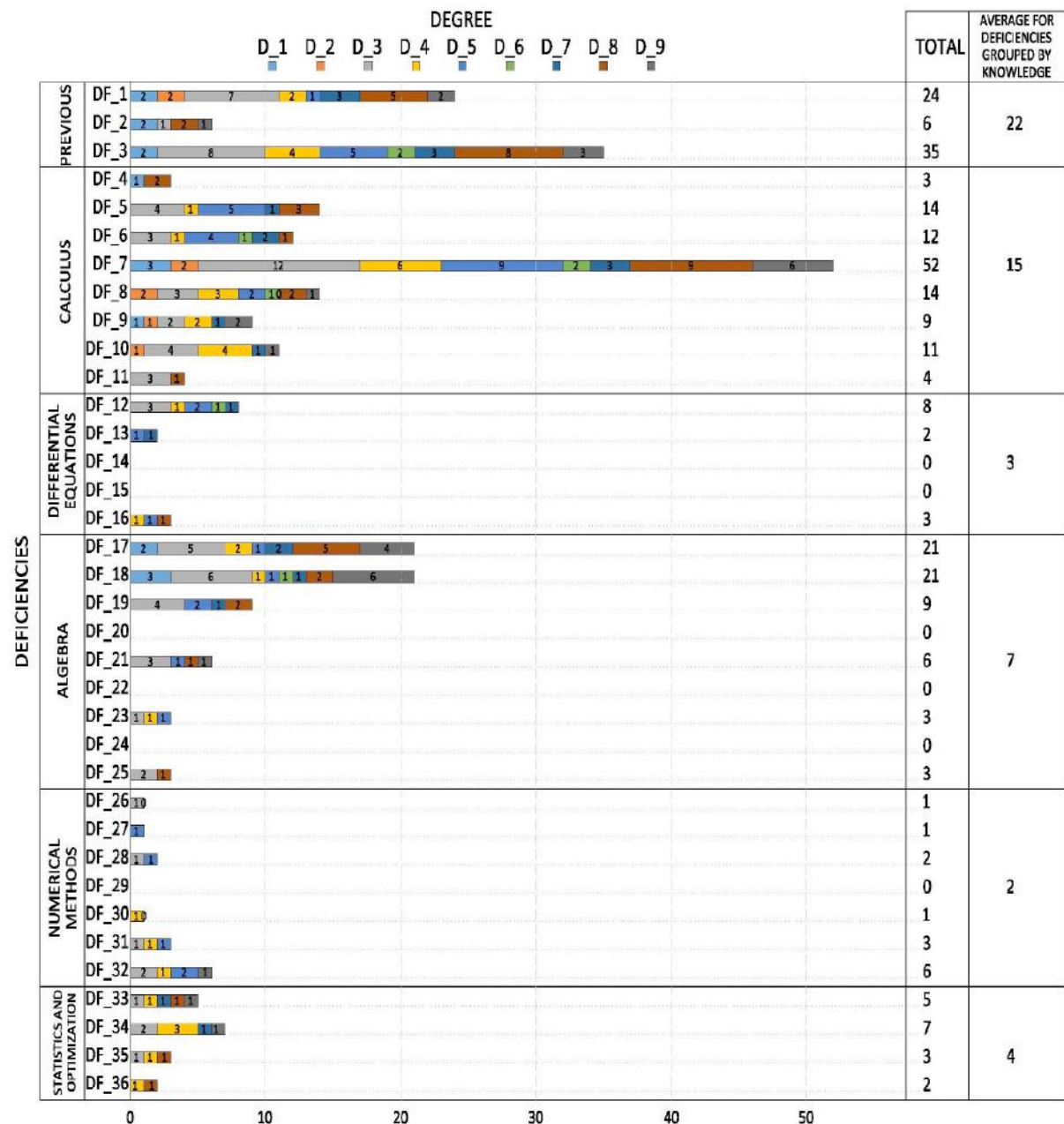


Figure 12: Mathematical deficiencies grouped by knowledge for each degree (D\_1: Architecture studies, D\_2: Telecommunications and Services Engineering, D\_3: Industrial Technology Engineering, D\_4: Chemical Engineering, D\_5: Mechanical Engineering, D\_6: Computer Engineering, D\_7: Electronic and Automatic Engineering, D\_8: Electrical Engineering, D\_9: Industrial Design Engineering and Product Development).

Figures 13 and 14 display the average values obtained as the ratio of the sum of all item frequencies divided by the total number of items in each knowledge group. From Figure 13, we can see that the bar charts corresponding to the degrees in Architecture Studies, in Industrial Design and Product Development Engineering and in Computer Engineering present a different pattern from the rest of degrees, illustrating the fact that they require a different mathematical knowledge. On the other hand, the bar charts corresponding to the degrees in Industrial Technology Engineering and Telecommunications and Services Engineering reveal the highest level of reported requirements.



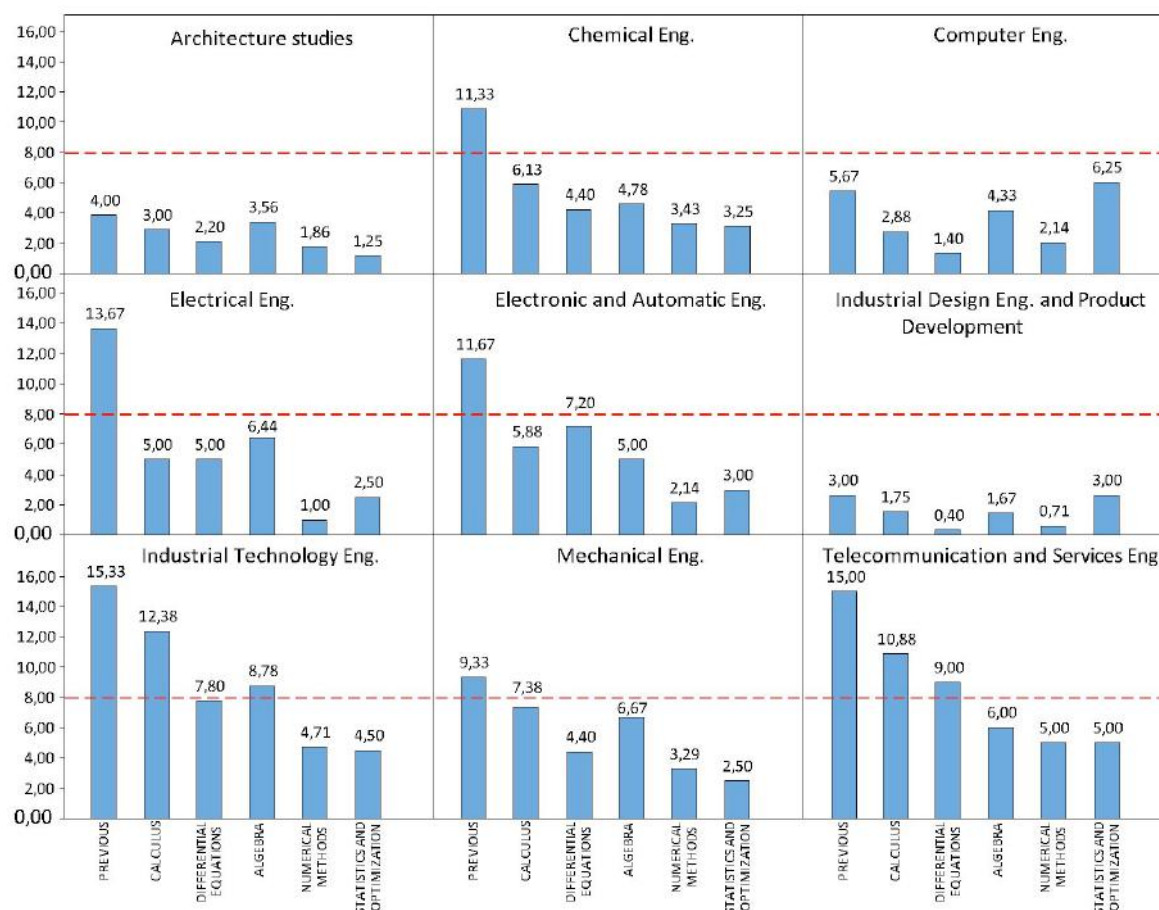


Figure 13: Average value of total requirements marked per knowledge group and degree.

With respect to deficiencies, Figure 14 shows that the degrees in Electrical Engineering and in Industrial Technology Engineering share a pattern representing a high level of detected deficiencies. In contrast, the degree in Telecommunications Technologies and Services is the degree with the lowest number of deficiencies, being concentrated in two groups: Previous and Calculus.

Moreover, in Figure 15 the average values of total deficiencies and total requirements for each degree are also provided. The position of each knowledge group in the graph, represented by a dot, shows a different profile for each degree; although some similarities can be also observed, as discussed before. For instance, in all the degrees, mathematical concepts and tools to be acquired in pre-university studies are the requirements and deficiencies most identified. This fact is going to be analysed in a second edition of the CEIP.

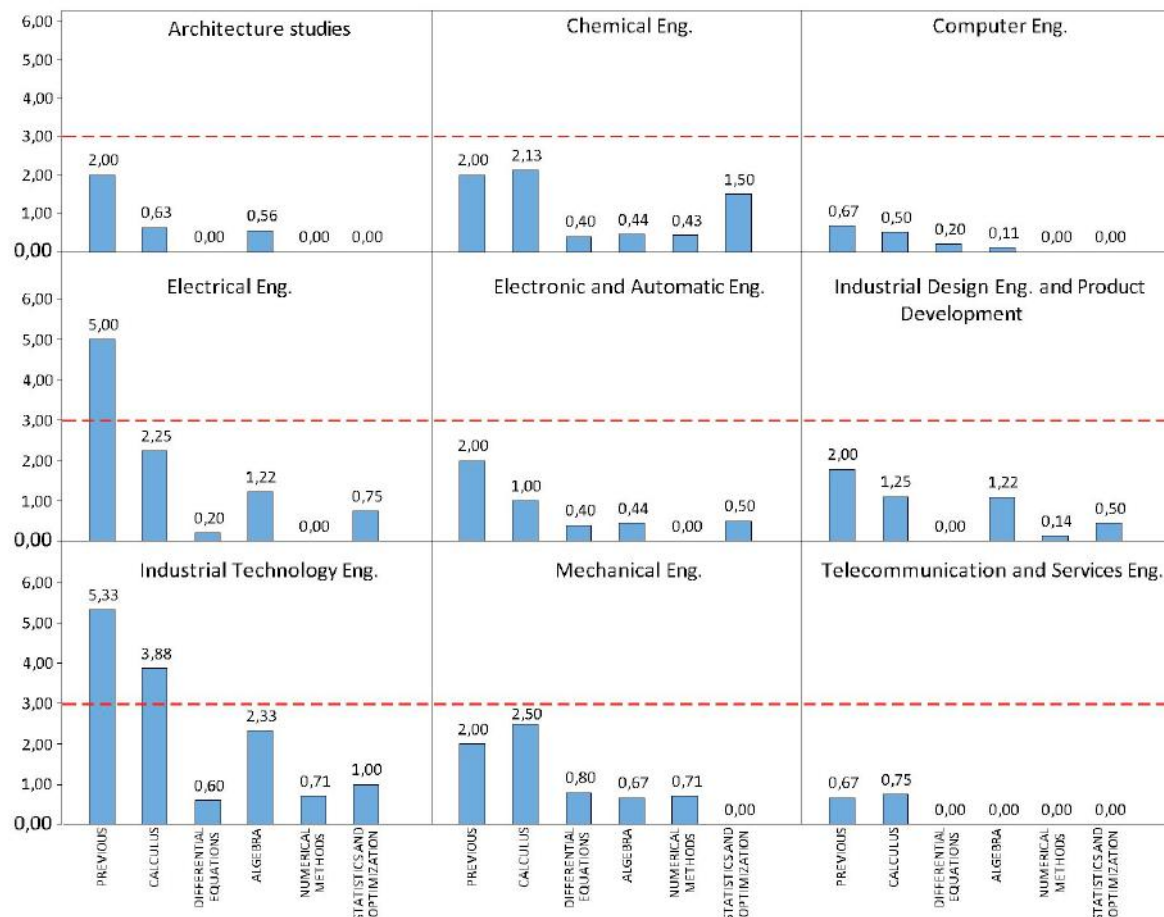


Figure 14: Average value of total deficiencies marked per knowledge group and degree.

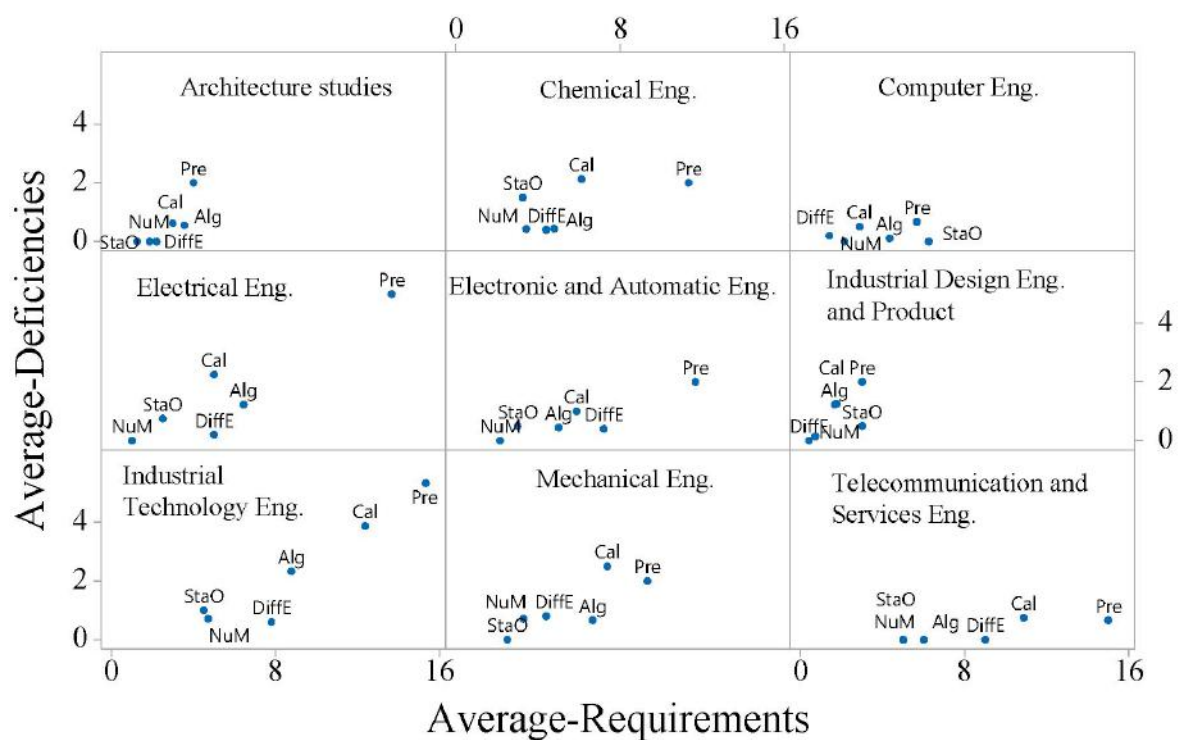


Figure 15: Average value of total requirements versus average value of total deficiencies per degree.

Finally, Figures 16 and 17 reflect the information collected in Template 4 (Phase III) about the availability of simple examples illustrating the application of the requirements in the context of non-mathematical subjects. A total of 161 professors indicated in the form their interest in providing this kind of examples. From Figures 16 and 17, we can see the distribution of these professors in the different degrees. It can be said that, in general, there has been a positive response to this initiative.

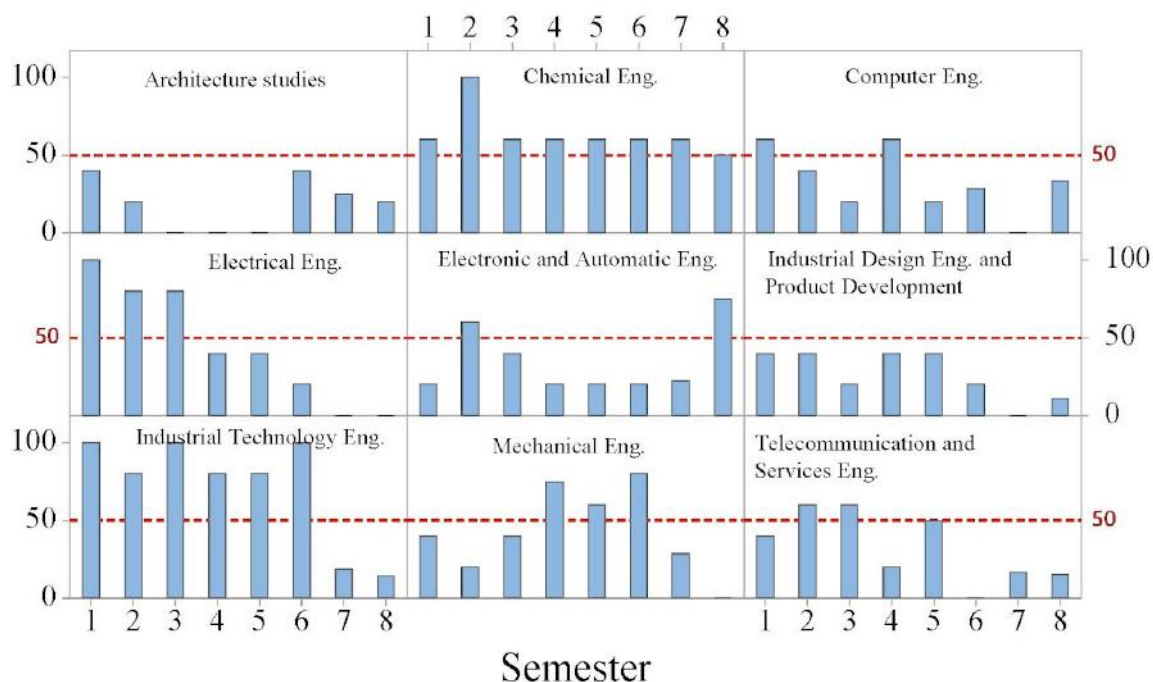


Figure 16: Percentage in the set of subjects in each semester and degree providing illustrative examples.

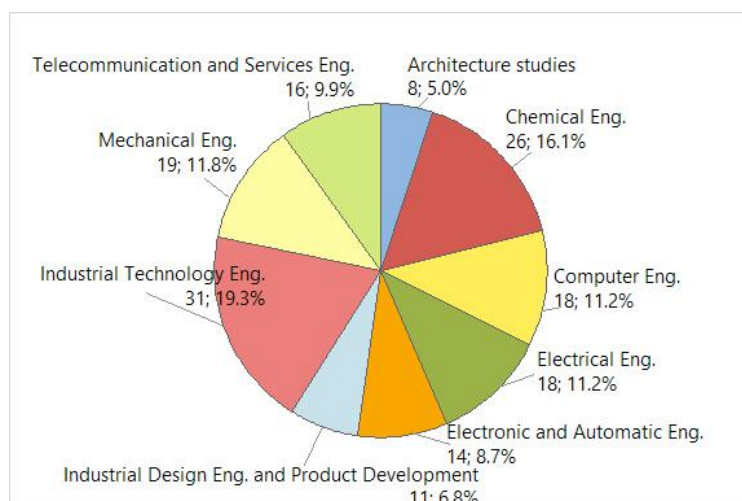


Figure 17: Number and percentage of subjects with illustrative examples.

## Conclusions

An efficient, active and collaborative methodology has been described to analyse the mathematical requirements that should be included in study plans of the undergraduate degrees of the School of Engineering and Architecture at the University of Zaragoza. The methodology applied is based on the activation of communication mechanisms between the



teaching staff of mathematical subjects and those of higher courses, in which the students must acquire the specific skills of each degree.

A number of activities have been described, such as meetings, discussions, round tables, digital document exchange, form design and completion. A great deal of information has been gathered about the mathematical knowledge required and its appropriate scheduling in all the degree programs analysed. All the information has been processed at two levels: global by degrees and sequential per semester in each degree. Some mathematical deficiencies that should be addressed in the initial training have also been identified.

The total number of subjects involved in the study is 455, corresponding to nine different degrees in Architecture and Engineering by the University of Zaragoza. 370 teachers have participated providing detailed data on 309 subjects, that is to say 68%. This percentage illustrates that the strategy applied is effective.

The strategy followed has facilitated the analysis of all the collected information and, consequently, the drawing of conclusions and proposals to improve the corresponding curricula as far as mathematical training is concerned. In addition, it has allowed teachers to collect material to contextualise the mathematical formation in different disciplines and to help the students to understand the relevance of the mathematical formation, motivating them in their study.

## **Acknowledgements**

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***What Drives Parents to Be More Involved in Their Child's Online Activities?***

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**Abstract**

In recent years, information has been accumulating from various sources around the world and in Israel indicating a continuous increase in children's accessibility to smartphones. The use of these devices, which enable access to the Internet, leads to a continuous increase in children's exposure to various dangers arising from surfing the Internet and introduces challenges regarding the role of parents and their technological knowledge. Hence, research questions arise as to whether a parent's general involvement in the child's life predicts his or her involvement in his or her child's online experiences and whether there are other variables that explain parental involvement. The participants in this study were 153 Israeli parents to children aged eight to 18 years old. An online questionnaire was developed based on the EU Kids Online 2020 Survey. Results show that not all parents involved in their child's life are necessarily involved in their child's online experiences. Technological knowledge has an essential contribution to parents' involvement in their child's online experiences. Also, parental involvement in the child's online experiences was found to be higher among parents of younger children.

Keywords: Technological Knowledge, Parents' General Involvement, Parent's Involvement in the Child's Online Experiences

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## **Introduction**

### **Parental involvement**

Parental involvement is defined as the level of the parent's active participation in the education of his or her children (Liu et al., 2020). Parental involvement has great importance and influence in a variety of aspects of the child's life, and that involvement should be seen as an ongoing process from childhood to adulthood (Durisic & Bunijevac, 2017). The intrapersonal and interpersonal dynamics in the physical space are not the same as those that exist in the digital realm. Thus, optimal parental involvement in this reality requires the development of unique awareness and tools adapted to the developmental stages of children (Chandrima et al., 2020). In the current era, in which many rapid changes in technology are taking place, the gaps between adults and young people are growing and creating changes in parenting and in parent–child relationships (Glatz et al., 2018; Papadakis et al., 2019; Peled et al., 2019). When parents are less involved and do not monitor their children's use of the Internet, their child is more likely to be exposed to cyberbullying (Lozano-Blasco et al., 2020).

These gaps raise the following questions: whether parents' general involvement in their child's life predicts their involvement in the child's online experiences and whether all parents that are involved in their child's life are necessarily involved in their child's online experiences. Are there differences between mothers and fathers in parental involvement in general and in the child's online experiences? And does parents' technological knowledge also contribute to parental involvement in the child's online experiences? We hypothesised that parents' use of technology and parents' general involvement in their children's lives will be related to the parents' involvement in the children's online experiences.

### **Parents' involvement in the child's online experiences**

Over the past three decades, the use of the Internet and digital technologies has become a central part of the lives of children and adolescents (Martin-Criado et al., 2021). The rise in the development of technology significantly affects most areas of life, including the way humans communicate, consume information, and manage daily activities (Shin & Kang, 2016). Parents' involvement, preferences, and beliefs towards the social network have a direct impact on the quality and quantity of digital media their children consume (Papadakis et al., 2019), so optimal involvement in this reality requires the development of unique awareness and tools adapted to children's developmental stages (Chandrima et al., 2020). Children (especially at a young age) are considered to be lacking the cognitive and mental ability to understand the complexities of using the Internet and to deal with the dangers that exist on it. Therefore, many parents feel the need to expand their technological knowledge and skills to support their children's education in this new reality, in which the social network occupies a central place in the lives of the younger generation (Musgrove et al., 2021). It was also found that, compared to boys, girls receive more guidance and mediation on the social network from their parents (Livingstone et al., 2017).

Accordingly, it is hypothesised that, with respect to the child's age, there will be a difference

in parental involvement in a child's online experiences. Moreover, it is hypothesised that parental involvement in a child's online experiences will be greater among girls.

## **Methods**

### **Participants**

The participants in this study were 153 Israeli parents to children aged eight to 18 years old. The parents consisted of 110 mothers (71.9%) and 43 fathers (28.1%), with a mean age of 49.79 years ( $SD = 5.39$ , range 40–66 years). The children included 80 girls (52.3%) and 73 boys (47.7%), with a mean age of 12.95 years ( $SD = 2.38$ ). Most parents were married ( $n = 120$ , 78.4%), and others were separated or divorced ( $n = 27$ , 17.6%), single ( $n = 3$ , 2.0%), or widowed ( $n = 3$ , 2.0%). Most parents had an academic degree ( $n = 109$ , 71.2%), and others had completed high school ( $n = 44$ , 28.8%). Most were Jewish ( $n = 136$ , 88.9%).

### **Instruments**

Based on the EU Kids Online 2020 Survey (Smahel et al., 2020), an online questionnaire was developed for this research.

#### ***Parents' use of technology***

Six items asked the parents about the frequency of their use of online technologies, such as social media, email, WhatsApp groups, and information search engines. Responses range from 1 (does not use at all) to 5 (high-frequency use), and an acceptable internal consistency was found:  $\alpha = 0.76$ . The total score was composed of the mean of the items such that a higher score reflects a higher frequency of online technology use.

#### ***Parents' general involvement in the child's life***

Eight items asked the parents about their involvement in their child's life. These include 'I participate in various events of my child', 'I talk with my child about television programmes', and 'My child's rules of conduct are set by negotiation and mutual consent'. Responses range from 1 (does not agree at all) to 5 (highly agree), and an acceptable internal consistency was found:  $\alpha = 0.73$ . The total score was composed of the mean of the items such that a higher score reflects greater parental involvement.

#### ***Parents' involvement in the child's online experiences***

Ten items asked the parents about their involvement in their child's online experiences. These include 'I talk with my child about his or her involvement in online games', 'I am aware of my child's exposure to cyberbullying', and 'I am aware of my child's web-browsing habits'. Responses range from 1 (does not agree at all) to 5 (highly agree), and a high internal consistency was found:  $\alpha = 0.91$ . The total score was composed of the mean of the items such that a higher score reflects greater parental involvement.

## Procedure

Online questionnaires were sent to parents via social networks. Participating parents were sampled for convenience (non-probabilistic sampling). All parents participated in the study of their own free will and were guaranteed complete anonymity in completing the questionnaire.

## Data Analysis

Data were analysed with SPSS 28. Background variables were described with frequencies and percentages and means and standard deviations. Cronbach's  $\alpha$  was calculated for internal consistencies. The study variables were described with means and standard deviations, and Pearson correlations were calculated between them. The relationships between the study variables and the background variables were analysed with Pearson correlations. Multiple linear regressions were calculated for parental involvement in the child's online experiences.

## Results

Parents have perceived themselves as being rather frequent users of online technology and reported moderately high involvement in their children's general and online lives. Parents' use of technology and their general involvement in their children's lives were positively related with their involvement in children's online experiences (Table 1). Involvement in the children's online experiences was negatively related with the children's exposure to potentially harmful content.

Table 1. Means, standard deviations, and inter-correlations for the study variables  
( $N = 153$ )

	M (SD)	1.	2.	3.
1. Child's exposure to harmful content	1.53 (0.57)			
2. Parents' use of technology	4.37 (0.60)	-0.12		
3. Parents' general involvement	3.70 (0.57)	-0.02	0.12	
4. Parents' involvement in the child's online experiences	3.77 (0.86)	-0.30***	0.24**	0.40***

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ . Note: Range 1-5.

Several relationships were found to be significant between the participants' background characteristics and the study variables. Parent gender was related with general involvement in the child's life such that mothers' general involvement ( $M = 3.79$ ,  $SD = 0.47$ ) was higher than that of fathers ( $M = 3.49$ ,  $SD = 0.73$ ) ( $t(56.58) = 2.44$ ,  $p = 0.018$ ). Child gender was related with parental involvement in the child's online experiences such that involvement was higher for girls ( $M = 3.96$ ,  $SD = 0.81$ ) than for boys ( $M = 3.56$ ,  $SD = 0.87$ ) ( $t(151) = 3.00$ ,  $p = 0.003$ ). Further, the child's age was negatively related with parental involvement in the



child's online experiences ( $r = -0.23$   $p = 0.004$ ). A parent's age was unrelated with the study variables ( $p = 0.239$  to  $p = 0.868$ ). Finally, the use of technology was more frequent for parents with an academic education ( $M = 4.49$ ,  $SD = 0.58$ ) than for parents with a high school education ( $M = 4.07$ ,  $SD = 0.54$ ) ( $t(151) = 4.10$ ,  $p < 0.001$ ). General involvement in the child's life was higher among parents with a high school education ( $M = 3.89$ ,  $SD = 0.49$ ) than among parents with an academic education ( $M = 3.63$ ,  $SD = 0.58$ ) ( $t(151) = 2.60$ ,  $p = 0.010$ ). In light of these relationships, parent gender (1: fathers, 0: mothers), child gender (1: boys, 0: girls), child's age, and parent level of education (1: academic, 0: high school) were controlled for when the study hypothesis was examined.

A multiple regression model was calculated for parental involvement in the child's online experiences (Table 2).

Table 2. *Multiple linear regressions for parental involvement in the child's online experiences (N = 153)*

	Parental involvement in the child's online experiences		
	B	SE	$\beta$
Child's age	-0.08	0.03	-0.21**
Child's gender (boy)	-0.25	0.12	-0.15*
Parent's gender (father)	0.08	0.14	0.04
Parent education (academic)	-0.26	0.15	-0.13
Parent's use of technology	0.32	0.11	0.22**
Parent's general involvement in the child's life	0.53	0.11	0.35***
Adj. $R^2$	0.265***		
F	F(6, 146) = 10.06***		

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

Results show that this model is significant, with about 26% of the variance being explained in parental involvement in the child's online experiences. Parental involvement in the child's online experiences was higher for girls and younger children, as well as with higher parental use of technology and higher parental general involvement in the child's life.

## Discussion

The present study aimed to examine which variables predict parental involvement in a child's online experiences. When the parent is more aware, more involved, and more knowledgeable about what content his or her child is using, he or she can better direct the child to reduce and even prevent cyberbullying against the child (Vandebosch & Van Cleemput, 2009).

According to the first hypothesis, there will be a positive relationship between parental involvement in the child's life and parental involvement in the child's online experiences. Research findings indicate that this hypothesis has been confirmed. As Internet use becomes widespread at home, parents are trying to maximise their children's online opportunities while also minimising online risks (Livingstone et al., 2017), and parents' online involvement

contributes to success among children in the virtual environment (Qasim et al., 2021) while keeping children less exposed to cyberbullying (Lozano-Blasco et al., 2020). At the same time, it seems that not every parent who reports involvement in a child's life is indeed also involved in his or her child's online experiences.

Subsequently, another research hypothesis emerged that there is a positive relationship between a parent's use of technology and his or her involvement in his or her child's online experiences. The findings of the study indicate that this hypothesis was also confirmed. A significant positive relationship was found between a parent's use of technology and his or her involvement in the child's online experiences. This relationship is also found beyond the parent's general involvement in the child's life and is supported by the notion that, for a parent to be more involved in his or her children's online experiences, he or she must have digital skills (Vandebosch & Van Cleemput, 2009). Parents with higher levels of digital skills who believed in their ability to influence their children and encourage their children to use the social network safely (Glatz et al., 2018) understand and criticise what their children are doing online (Smahel et al., 2020). It was also found that a parent's use of technology was more frequent for parents with an academic education than for parents with a high school education but was unrelated with his or her age. It seems that parents with a higher level of education adapt more easily to new conditions and strive to develop a better learning environment at home.

Moreover, the present study found that parental involvement in the child's online experiences was higher among parents of girls and parents of younger children. Parents may feel a greater need to care for and protect girls and young children, or girls and young children may allow more parental involvement compared with boys or older children.

## **Conclusions**

Parental involvement in their children's lives in general and in their children's online experiences in particular is very important in the technological age, in which mobile devices that facilitate surfing the Internet are an integral part of the children's routine.

The novelty in this study is that not every parent who reports involvement in their child's life is also involved in their child's online experiences. Current findings imply that beyond basic involvement in a child's life, a parent's use of technology will predict involvement in his or her child's online experiences. Therefore, in therapeutic work and parental guidance, it is important to raise parents' awareness of the importance of parental involvement in general and parental involvement in online experiences in particular and to provide tools to implement that involvement. In addition, it is recommended that lectures be conducted for parents on digital knowledge and skills so that they can feel confident and believe in their ability to be involved in this significant area of network life. The study is particularly relevant in the current era, in which the gaps between the child and the parent are growing, and a change of roles can be seen, in which parents more often need help and mediation from their child to integrate and orient themselves on social networks.

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## *Teaching in Times of Crisis – What Have We Learned (So Far)?*

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### **Abstract**

Coronavirus disease has made an enormous impact on many fields of functioning, including the educational system. This impact was pronounced in higher educational system and accelerated the transition toward remote learning strategies in medical education, leading from traditional to online education during crisis. The aim of this article is to review the body of literature on medical education in the COVID-19 pandemic, as well as creating guidelines that can help improve and prepare the educational system for possible future crisis situations. A systematic review on the MEDLINE/PubMed database was performed on April 10th, 2022. We paired the terms "COVID-19", "coronavirus", "education", "training", "students" and "university" and the search initially yielded 214 articles. After examining effective literature, these studies showed that COVID-19 crisis has required to adapt student learning methods in order to improve and enable uninterrupted learning processes during the ongoing pandemic, mostly by implementing telemedicine-based training and virtual learning platform through webinars, virtual classroom, video and teleconferences, as well as online/mobile learning resources and simulation-based learning. Medical education in future will be complemented by multimedia elements and new strategies for using technologies for education. The advantages to innovation practices mainly included improved accessibility and implementation of new assessment techniques. Ensuring conditions for acquiring knowledge in a profession that cares of the well-being of others is always a priority and, although covid measures are becoming milder and do not have an enormous impact on education currently, some innovations that arose during the pandemic may be worth keeping.

**Keywords:** Educational System, COVID-19, Crisis, Medical Students, Systematic Review

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## Introduction

Coronavirus disease has made an enormous impact on many fields of functioning, such as social relations and the economy. It raised concerns and fear of being infected or transmitting the coronavirus infection to others in many people throughout the globe. Furthermore, it affected whole world's health systems (Singh & Singh, 2020), as well as educational ones. This impact was especially pronounced in higher education system. Closure of schools and universities affected more than 1.5 billion students and youth across the globe (Tarkar, 2020), with much of the teaching transferring from offline to online mode.

Medical students belonged to a highly vulnerable group of students during the pandemic and consequent changes in the educational system and modes of teaching and learning. Students' daily commute to teaching hospitals was a method of the virus spreading, so the cancellation of instructional programs and the use of virtual teaching methods have been put on the agenda during the past period (Ahmed, Allaf & Elghazaly, 2020). Furthermore, redistribution of medical staff to COVID wards, postponement of elective procedures, turning of wards into COVID wards and many other changes in medical system made in order to reduce exposure to the virus led to difficulties in performing student medical practice through lack of practical skills training, limited feedback and supervision, but also through motivational and mental health factors, which were additional aggravating factors in an already difficult situation (Hau, Weitz & Bork, 2020). Since an important part of medical education includes hospital-based education, rotations between departments and hospitals and having clinical mentors, the difficulties in performing the practical part of medical education imposed by coronavirus pandemic could certainly leave a significant impact on future doctors (Ahmed, Allaf & Elghazaly, 2020). Further, COVID-19-related challenges to clinical teaching have adversely impacted mental well-being of medical students globally (Sharma & Bhaskar, 2020), which is not surprising considering all the aforementioned difficulties in medical education they were faced with, alongside the additional concern of being a possible risk to patients, in addition to caring for their own and the health of their closed ones.

COVID-19 pandemic significantly left its mark on certain medical fields and students involved in them, such as clinical training which includes working with aerosol-generating equipment (Hassan & Amer, 2021). Anatomy education, as one of the basic parts of medical education, was not only hindered by the need for social distancing, but also because the use of cadaver specimens has the potential risk of virus transmission, leading to restrictions in educational process (Singal, Bansal & Chaudhary, 2020). The psychomotor and affective components of medical learning are being affected the most; virtual exposure is not sufficient enough to teach understanding and managing of patients, a humane approach which is highly important in medicine, as well as skills important in surgical practices (Kumar et al., 2021), which were hindered by on-line learning methods and other constraints in medical teaching imposed by the pandemic.

With all of the problems and changes in medical education system that came with the pandemic, importance of preparing the educational system for such crisis situations became a topic of immense importance. Quality coping with such situations is important for the entire education system and for students and experts in various fields, especially for future medical staff. In this systematic review paper, we focused on analyzing methods used in the state of crisis such as the COVID-19 pandemic, with the aim of learning from this experience and creating guidelines that can help improve and prepare the educational system for possible future crisis situations. Ensuring conditions for acquiring knowledge in a profession that

cares about the health and well-being of others is always a priority and, although covid measures are becoming milder and do not have an enormous impact on education currently as in the last few years, being prepared for similar future situations is of high importance.

A systematic review on the MEDLINE/pubmed database was performed on April 10th, 2022 and updated on July 1st 2022. We paired the terms “COVID-19”, “coronavirus“, „education“ „training“ „students“ and „university“ and the search yielded 214 articles. Based on relevance of content 161 records were excluded. Further, we excluded all systematic or narrative reviews and focused solely on original research articles/clinical studies. The final sample of studies included in the qualitative analysis consisted of 15 original studies, 14 of which contained some kind of evaluation of implemented practices, i.e. efficacy or learners' experience. The studies focused on educational practices implemented in the COVID-19 pandemic in the area of medical education, mostly medical students (N=7) and nursing students (N=4), but also other students (microbiology, paramedic; N=2), residents (N=1), faculty and doctors (N=2).

### **The main findings**

Studies included in qualitative synthesis are briefly presented in Table 1, where aims, methods, evaluation criteria and effectiveness or acceptability of implemented practices are displayed. By analyzing innovative educational practices that were used and evaluated in these studies, we can conclude that the transition to an online form of teaching required finding creative solutions in adjustment to constraints in teaching methods imposed by the pandemic. Baloyi, Jarvis et Mtshali (2022) stressed that the transition to online teaching and learning due to COVID-19 lockdown restrictions demanded fast adjustment in order to save the 2020 academic year, which was an ambitious goal, but using Donabedian's tripartite model (Donabedian, 2005) focused on the availability of legislation, policies or policy guidelines and resources available to support the changes in response to the interruptions caused by the pandemic, they presented their way of dealing with the limitations and necessary changes in educational system, as well as the positive effects they achieved. Regarding the use of innovative approaches in learning process, Rüllmann et al. (2022), analyzed efficacy of peer-to-peer virtual case-based auscultation course via video conference in comparison to literature self-study, an important research area due to contact restrictions and limited interaction with patients in pandemic time. They showed that participation in the virtual auscultation course led to a significantly improved aspects of cardiac auscultation skills, as well as higher satisfaction rates and a higher increase in self-assessed competence compared to participants who engaged in literature self-study. Authors concluded that such course may facilitate the further acquisition of an essential clinical skill such as cardiac auscultation, even when contact restrictions will be lifted. Onwards, adapting and implementing new technologies such as 3D holograms with mixed reality proved to be helpful to medical students and medical professionals in better identification of pulmonary lesions (Liu et al., 2021). Liu et al. (2021) found in their study that 3D holograms with mixed reality had many benefits, such as lower frustration, lower mental and temporal demand. Therefore, such technology can be used in medical education to increase interest, improve understanding of body structures, improve spatial awareness, lower the learning curve. Adaptation that also proved beneficial for teaching was microlecture teaching. Kong et al. (2021) showed that microlecture teaching is superior to traditional teaching in a way that it improves theoretical and clinical operation skills of students as well as teaching satisfaction and has great potential in improving remote learning.

And while medical education can be easily delivered online, surgical skills training can be challenging to demonstrate online (Co & Chu, 2020). Research by Co et al. (2021) showed that there is no difference in performance between face-to-face teaching and web-based surgical skill learning session with live camera captured demonstrations. Therefore, this study demonstrates that even precise demanding skills can be taught successfully online. Nevertheless, lack of teaching personnel or restrictive measures can be problematic when medical skills need to be taught and demonstrated to students. Christiansen et al. (2020) compared live face-to-face demonstration with a video-based demonstration in personal protective equipment donning and doffing. Their findings suggest that there is no difference in performance between face-to-face and video-based demonstration. In addition, video-based demonstration proved to be resource-efficient as it took only one-third of the time compared to face-to-face demonstration, as well as could be watched many times and at any time.

Gamified learning is another technic that can be used to increase performance of virtual learning. Suppan et al. (2020) evaluated impact of gamified e-learning, but benefits were very limited. Therefore, more research and development are needed to further utilize gamified learning. On the other hand, Chang et al. (2022) examined nursing students' skill training in distance education via online game-based learning with the watch-summarize-question approach in comparison to solely using a video-based learning in control group; experimental group achieved statistically significant higher learning achievement, self-efficacy, learning engagement, and learning satisfaction than the control group. In accordance with some of the previously stated conclusions of mentioned research, integration of new computer technologies and teaching strategies should be considered as a standard for acquiring knowledge and skills, even in non-pandemic times, but thorough evaluation of effectiveness of each individual program should be made prior to implementing any new practices. Similar to gamified learning, simulation-based learning has a goal to increase performance of training. A human patient simulator is used to repeatedly experience the process of solving nursing problems through interactions in an environment similar to clinical setting (Son, 2020). Son (2020) found that simulator-based learning has a positive effect on learning attitude and critical thinking as well as learning transfer. It is also useful during pandemic because it doesn't put patient at risk. In a study which compared the impact of a commercially available virtual microbiology simulation (VUMIE™) with a traditional wet laboratory (wetlab) on pharmacy students' knowledge, skills and confidence (Baumann-Birkbeck et al., 2021), authors expressed positive views on using technology-based innovative practices. Since virtual simulation provided similar effects on students' knowledge, skills, and confidence as a traditional laboratory, and taking into account that simulation's implementation was not cost-prohibitive and provided students with a safe learning environment supporting deliberate practice, such practice could be implemented as a regular or additional educational method.

In examining nursing students' attitude on the practice of e-learning, Thapa et al. (2021) showed that minority of students evaluated e-learning as effective as traditional, although majority still had a favorable attitude regarding e-learning. As the main advantage of e-learning reduced costs and the ability to stay at home were stated, while internet problems and technical issues were major recognized disadvantages. In a study by Mortagy et al. (2022), most medical students claimed that online teaching is not as effective as face-to-face teaching, with many students evaluating teachers as not well prepared for the online sessions. Of course, on-line teaching methods differ significantly from each other, so it is quite important to investigate the efficiency and appropriateness of each individual method for



obtaining different types of knowledge and skills. In another research, while analyzing the impact of face-to-face teaching in addition to electronic learning, Currat et al. (2022) showed that live teaching improved skill acquisition and enhanced skill retention. Contrary to the stated finding, another study (Heitmann et al., 2022) examined the lecturer ratings of student's theoretical knowledge and practical skills in two clinical teaching formats, with and without patient contact, where the group without patient contact was rated significantly better by the lecturers. On the other hand, students expressed negative views on teaching format without patient contact and commented that lack of contact with patient during the course hampers their ability to apply the practical skills acquired in a clinical context. Since working with patients will be an integral part of clinical practice in student's future work, student's perceptions and needs are certainly important and should be considered atop of lecturer ratings of students' skills. Ahmad et al. (2020) analyzed upsides and downsides of both face-to-face and distance learning and concluded that both have strengths and weaknesses and shift in the future needs to be done with caution. That is in line with the idea of adjusting medical, as well as other university programs, to new technologies and virtual practices which are nowadays used in majority of areas, but also with an important notion that efficiency and appropriateness of each individual new method should be thoroughly scientifically explored before put to use as a teaching practice.

## Conclusions

Analyses showed that various effective online solutions were employed, some of which could become a standard in future educational practice. Nevertheless, some studies mentioned shortcomings of certain forms of analyzed methods. Considering the variety of techniques used and the results obtained, it is of extreme importance to continue investigating the usefulness and applicability of new teaching methods and to use those that prove to be of high quality. This is important both for uncertain periods such as adaptation to the pandemic, which we recently encountered, but also when forming new guidelines for educational system, which is increasingly shifting towards new technologies. According to previously mentioned studies, innovative practices may include: technology-enhanced learning in form of webinars, virtual whiteboards, blogs, google classrooms, videoconferences, videocasts, websites, online conferences, simulation-based learning, virtual reality mobile learning, as well as technology-enhanced learning combined with traditional learning strategies. Furthermore, different technology-enhanced educational practices emphasize investment in virtual reality and the use of portable equipment (mannequins), newly created teaching practices and the use of information and communication technology platforms and online education methods (lectures and notes sent in the virtual learning environment, receiving notes via email and content production on the website, Instagram and YouTube) (Hao et al., 2022). In creating the online content for a specific area, type of knowledge or skill that should be learnt, it is necessary to consider student's perception and suggestions as to improve student satisfaction, which is necessary for their motivation for learning and career preparedness (Farrokhi, Mohebbi, Farrokhi & Khami, 2021). Advantages of technology-enhanced educational practices include greater flexibility, time saved on traveling to university and less costs incurred compared to physically attending university (Dost, Hossain, Shehab et al., 2020). However, in order to achieve optimal medical education, comprehension and consideration of limitations in e-learning, such as social isolation, lack of student-teacher interaction or technical and connectivity problems, is highly important in creating educational programs (Abbasi, Ayoob, Malik, Memon, 2020).

Innovative educational practices implemented in COVID-19 pandemic have undoubtedly ensured the continuity of education, bypassed many of the barriers to quality medical education created or compounded by the pandemic and broadened the possibilities of learning about specific areas of knowledge and skills that are less accessible to students during their training. Further, this pandemic provided unique opportunities for teaching about medical care in crisis, through the mentored and supervised involvement of students in patient care, in line with their competence/educational level.

Key points of the current review can be summarized through several areas which have been stressed through research on educational practices during the pandemic and these points should be considered in making new policies in educational systems, as well as in preparing the educational system for possible future crisis situations. These important topics include addressing the availability of technical prerequisites, which is absolutely indispensable, as well as financial cost of innovative educational solutions, which limit the availability of e-learning practices in developing areas. Further, considering the diversity of new practices, evaluation of their effectiveness, relying on relevant criteria, is highly important since effectiveness of practices may vary for different areas of medical teaching. Also, in accordance with the aforementioned, faculty/educators need to be trained for effective use of innovative educational practices. Important notice is that innovative practices can be built upon existing ones, as a logical extension and a useful upgrade that can be of use in achievement of learning objectives. Since hands-on experience needed for developing specific skills can be limited in crisis situations, a need to balance these difficulties in mastering skills through other, possibly new and technology-based teaching methods or educational activities is important. Due to contact restrictions and limited interaction in situations such as COVID-19 pandemic, limited possibilities of interacting with educators and other students was noticed; therefore, enabling systematic and elaborated online communication and mentoring in such conditions is extremely important. Onwards, since passive practices tend to be less engaging and stimulating for students, possibly affecting their learning process, it is important to ensure an active role for students, even when it comes to virtual learning methods and techniques.

Crisis situations such as this one need to be used as a learning experience for future crises. Teaching and learning processes and new techniques and practices should be further studied to gain a deeper understanding of the educational process in order to introduce necessary and useful changes and adjustments in educational system.

Author Year	Aim / Methods	Evaluation Criteria	Effectiveness /Acceptability
Rüllmann et al. (2022)	Learning cardiac auscultation skills via: A) Virtual case-based auscultation course held via video chat vs. B) Literature self-study	Performance using a high-fidelity auscultation simulator (SAM II); Satisfaction rating and a self-assessment of competence	Virtual auscultation course - improved description of heart murmurs; no difference between the groups in diagnostic accuracy and identification of the point of maximal intensity Virtual cours - higher satisfaction rates and a higher increase in self-assessed competence
Baloyi et al. (2022)	Nursing education faculty adopting Donabedian's tripartite (2005) model as the framework for the report on the transitioning to online teaching, learning and assessment	No	
Mortagy et al. (2022)	The medical students experiences with online education, anxiety, perceived academic performance and obstacles related to online education	Perception and the impact of online education on medical students' anxiety and perceived level of performance	Rise in hours spent on online education; recorded video tutorials rated most effective; minority inform of online form as non-stimulating and difficult to engage in; less than half enjoyed online medical education; identified positive side was less time consumption
Currat et al. (2022)	The respondents were divided into 2 groups (only online learning, and online learning + live learning)	Performance after knowledge acquisition	Group with combined (e-learning and live) learning scored better
Heitmann et al. (2022)	Presence-based teaching formats with and without patient contact	Performance (students' overall grading of the course); ratings of knowledge and skills by students and lecturers	The teaching format without patient contact-lower grade by students; Students' self-ratings did not differ between the two formats; Practical skills rated better in the group without patient contact by the lecturers
Chang et al. (2022)	Integrating online game-based learning with the watch-summarize-question strategy (experimental group) to improve nursing students' learning in sputum suction skill training; control group used video-based learning	Performance and satisfaction: learning achievement, self-efficacy, learning engagement, and learning satisfaction before and after the intervention	The experimental group - significant higher results in all measured variables
Baumann-Birkbeck et al. (2021)	Simulation intervention (VUMIE™) to improve learning outcomes of pharmacy students, when compared to a traditional wetlab intervention.	Performance (knowledge, skills) and confidence measured. Data was collected at baseline, post-intervention (VUMIE™ or wetlab) and endpoint.	Both interventions improved knowledge, skills and confidence; VUMIE™ outcomes comparable to the wetlab activity.
Thapa et al. (2021)	This study aims to identify the nursing students' attitude towards the practice of e-learning amidst COVID-19	Students' attitude towards e-learning were analysed: advantages and disadvantages, effectiveness, attitude of students regarding e-learning.	The main advantage of e-learning was stated as the ability to stay at home, reduced costs; internet problems was the major disadvantage, followed by technical issues. E-learning evaluated as effective as traditional by minority. Majority still had a favorable attitude regarding e-learning.
Liu et al. (2021)	The goal was to determine whether viewing a 3D hologram with mixed reality techniques can improve medical professionals' understanding of the pulmonary lesions caused by COVID-19	Participants divided into either the 2D CT group or the 3D holographic group; the task involved identifying lung lesions caused by COVID-19; participants' performance was afterwards rated by professional; Educational utility and efficiency of 3D holograms was assessed.	The 3D group - higher results in performance and assessments.
Kong et al. (2021)	The aim of the present study was to evaluate the advantages of the microlecture teaching method on students in standardized residency training	Traditional teaching group (control group) VS. the microlecture teaching group (observation group). Students were assessed on teaching effect, theoretical operation, and clinical practice satisfaction. The students also evaluated the teachers, and the teachers evaluated the students.	All assessed higher in the microlecture teaching group.
Co et al. (2021)	A new web-based surgical skill learning session (WSSL). This case-control study evaluates the surgical skills competency of medical students taught by the WSSL vs conventional tutorials	Independent blinded assessment was performed by a standardized marking scheme.	Surgical skills performance comparable between students in two groups.
Suppan et al. (2020)	The aim was to evaluate the impact of a gamified e-learning module on adequacy of PPE in student paramedics	The control group - guidelines; The e-learning group - gamified e-learning module right after the guidelines	Gamified e-learning module increases the rate of adequate choice of PPE among student paramedics working in an ambulance service.
Ahmed et al. (2020)	This qualitative study aimed to develop a model for utilizing Distance Learning (DL) using The Polarity Approach for Continuity and Transformation (PACT)™	Self-administered assessment based on identified problematic areas.	DL provides a good environment for most students.
Son H. K. (2020)	Traditional maternity clinical practicum VS Simulation problem-based learning (S-PBL)	Self-reported questionnaire (learning attitude, metacognition, and critical thinking).	Learning attitude and critical thinking increased in the S-PBL group.
Christensen et al. (2020)	This study compared live instructor-led training with video-based instruction in personal protective equipment (PPE) donning and doffing	A blind evaluation of performance using checklists was performed.	No significant difference between groups.

Table 1. Aims, methods and evaluation of 15 original studies included in review

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***Mathematical Algorithm for Understanding Numbers and Their Operations Integrated  
Into the Cornerstone of Learning in a Pelmanism Game: Mathesso***

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**Abstract**

Mathesso, a novel board game focusing on explaining elementary mathematics to kids of all ages, is presented. Using the principle „learning by playing,“ Mathesso allows children to acquire a rich intuition about the structure of the number system. The game has a strong potential for reaching comprehensive and rapid growth as a learning tool worldwide, including in developing countries, since there is no need for a good quality teacher to reach full game potential. The game's goal is to activate cognitive processes responsible for the origin and development of mathematical intuition. Mathesso is based on the palmesian principle connected to mathematical operations. The teaching principle is based on the unique mechanism of reverse synaesthesia responsible for perceiving dependencies between numbers. Using this method, children can gain a deeper understanding of inherent connections in math while avoiding mechanical memorization, which is the leading cause of difficulties in learning mathematics. By playing this game, kids can quickly and naturally understand the principle of multiplication, division, powers, prime numbers, Fibonacci numbers, factorials, and more, explaining their principles. Moreover, the game is also strategically very appealing and thus has the potential to become a challenging strategic game on an international competition level.

Keywords: Reverse Synaesthesia, Pelmanism, Mathematical Intuition, Numbers, Strategic Game

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## Introduction

The game's goal is to activate cognitive processes (as described by Petty, R., & Briñol, P. (2015)) responsible for the origin and development of mathematical intuition (Johnson, S., & Steinerberger, S. (2019)). The Mathesso game is designed to influence children while playing subconsciously and uses basal arithmetic (Song, C., et al. (2021)), to introduce them to selected mathematical operations.

While playing Mathesso, pre-school children may quickly evolve the so-called backbone algorithmic system (Elizabeth S. Spelke (2017), Katherine D. Kinzler, & Elizabeth S. Spelke (2007)). Children do not need to know a single number, and simply by orienting themselves by colors, they understand the principle of multiplication, prime numbers, powers, and, among other things, they will gain intuitive knowledge of the multiplication table.

Once upon a time in the ancient history of humanity, there was a time when people did not know how to count (Osterlind, S. (2019)). They couldn't count the sheep in the pasture nor share a loaf of bread fairly. They couldn't tell how many children they had or if they had enough food. They couldn't even count the days left before it was spring again. Imagine them sitting in a freezing cabin with no more food and no idea how long the snow storm had lasted because the only variable they could work with was yesterday or tomorrow. Two days earlier was the same as last year for them. And all that because the math didn't exist yet. The first very tentative hints of mathematics began to appear in prehistoric times, but it wasn't born until ancient Greece (Narlikar, J. (2021) and Cooke, R. (2013;2012;2014)). It has been evolving ever since. Today it is everywhere in every object around us and every moment of our lives. Without mathematics, we couldn't build a house or make tea. We wouldn't have cars or planes or showers or carousels. Without maths, we wouldn't be able to make a phone call, and more seriously still, we wouldn't be able to watch cartoons. Everything you can imagine is imbued with mathematics. Sadly to say, many kids don't like mathematics despite the fact how important it is. They fear, don't understand, and never really learn. And then they miss it all their lives.

Why are children so happy to learn to talk and paint and write and read every puzzle and anything interesting, but not mathematics, which is the essence of interestingness? How is it that they don't see its intrinsic beauty, and despite all the efforts of parents and teachers and the positive and essential ways that math improves our lives, most people hate it (Larkin, K., & Jorgensen, R. (2015;2016), Xolocotzin, U. (2017) and Perschbacher, E. (2016))?

We found out how in many cases, young children develop the ability to perceive numbers and what causes them to stop getting on well with the numbers at some point. And how this misunderstanding turns into a lack of self-confidence, and how children gradually develop a kind of allergy to the numbers and then never want to hear about it again (DiStefano, M., O'Brien, B., Storozuk, et al. (2020) and Stearns, M. (2013)). Therefore we created a universal math game in which players don't have to count or even know the numbers. The game can solve these misunderstandings. The game that children and adults enjoy and that not only teaches them how to count but, above all, opens the way to fundamental mathematics. Because counting and mathematics are not the same (Ziegler, A. (2017)). This is the first of many misunderstandings set straight by playing Mathesso.

The most crucial educational mechanism of Mathesso is reverse synesthesia (Ashok S. Jansari, Mary Jane Spiller, & Steven Redfern (2006), Simner, J., & Bain, A. (2018), Green, J.



A., & Goswami, U. (2008), Gebuis, T., Nijboer, T. C. W., & Van der Smagt, M. J. (2009). Rinaldi, L., Smees, R., Alvarez, J., & Simner, J. (2020)). As complicated as it might sound, synesthesia itself is well known. It is a phenomenon when people associate certain sensory perceptions with others. For example, the ability to perceive music in such a way that colors or smells are perceived simultaneously as tones (Lacey, S., Martinez, M., McCormick, K., & Sathian, K. (2016), Tilot, A., Kucera, K., Vино, A., Asher, J., Baron-Cohen, S., & Fisher, S. (2018), Ward, J., Huckstep, B., & Tsakanikos, E. (2006) and Jäncke, L., Beeli, G., & Esslen, M. (2005)). Some of the greatest mathematical geniuses, who can count pi to one thousand two hundred and twenty-one decimal places off their heads, have this ability and use it. However, they obtained the knowledge strangely and unpredictably. “Well”, we said to ourselves. What if we used colors in some meaningful way instead of a hard-to-explain numerical system? For example, in the way that a different color represents each digit. This seemingly trivial substitution has the potential to open up a new level of teaching math.

We all had to memorize multiplication tables at a young age until we knew them by heart. The reason is that the origin of multiplication is empirical and not, as most people think, some clever formula. The absolute basis of mathematics, arithmetic, is a millennia-long observation of millions who have gradually discovered that if there are three people, they will never divide two sheep fairly. If there were four, they could get along. They would split into two groups of two, each group would take one sheep, and that is it. Peaceful solution. However, if there were five trying to split two sheep, a conflict would arise.

Indeed, the whole arithmetic is based on a set of observed basic properties of different situations. These observations form a multiplication table (Parker, G.. (2019), Barka, Z. (2017), Shaw, J.. (2022), and McElderry, H. (2021)). And that is the core of the problem, for there is no other way to acquire knowledge of this very long and tedious series of similar columns of easily interchangeable characters than to memorize it. Thus, it is no wonder that many children do not enjoy it. And if they don't want it, they may find it very difficult to learn. The younger they are, the harder it is (Spinillo, A., Lautert, S., & Borba, R. (2021), Nunes, T., & Bryant, P. (2021) and Cheng, Y.L., & Mix, K. (2014)).

Another problem is undue pressure to perform and the resulting low self-confidence. And most importantly, a way-too-early transition from arithmetic to mathematics is difficult to fully understand without perfect mastery of the basics. This creates the vicious circle results which we know so well (Farrés-Tarafa, M., Bande, D., Roldán-Merino, J., et al. (2021), Safitri, R., & Widjajanti, D. (2019) and Francis, B., Connolly, P., Archer, L., et al. (2017)).

### **Principle of the Mathesso game**

We developed the idea of turning the entire arithmetic apparatus into a game using the pelmanism principle (Wilson, S., Darling, S., & Sykes, J. (2011)). Children are successful in this game due to their extraordinary memory, which they enjoy. The basic principle of Mathesso is the same – to find two jettons that are identical. No matter what the strange little squiggles on the top and bottom of the jettons mean (those squiggles represent numbers). Moreover, reverse synesthesia makes it as easy to imprint arithmetic into their mental system as easily as if they were learning to talk. Children will easily substitute numbers with colors using a unique color ruler and understand the numbers as a byproduct of playing the game. However, we do not have to tell them all of that. Nor do we need to burden them with the fact that by playing this game, they will create a backbone algorithmic system involving their subconscious knowledge of all numbers, multiplication, division, powers, prime numbers,

Fibonacci numbers, factorials, and others. Nor will we bother them with the existence of the phenomenon of zero and its specifics. We will just let them play.

this game results are the research of several years of research into the thinking, comprehension, and learning, and its effect has potential to invaluable despite its relative triviality. If the methodological procedures we have developed are followed, children may gain a fundamental understanding of arithmetic, deep mathematical intuition (Hipolito, I. (2015)), and procedural logic. Indeed, the game overlaps with number theory and game theory. Higher variants of Mathesso (the following section) require a constantly changing strategy depending on each player's score, the number of players, and their skill and strategy. Players can reveal one or two cards at their discretion in each turn. Indeed, in higher versions of Mathesso, considerations need to include both the probability that a player scores a pair and that turning a second jetton gives additional information to other players. Understanding the different strategies in higher versions becomes crucial and arises quite naturally.

Nonetheless, as a result, we remind ourselves that we are still emitting about playing a memory game. None of the described herein requires any mathematical knowledge. Playing the game comes with an intuitive understanding of probability calculus, strategic reasoning, risk fluctuation, and the ability for reflective calculations and parallel thinking (Yang, X., Zhao, G., Yan, X., Chao, Q., Zhao, X., Lu, T., & Dong, Y. (2021)). And most importantly, insight into how beautiful mathematics is and its beauty is simply no accident. Other bonuses from playing Mathesso are advanced concentration and the ability to orient in a large set of confusing information. Children also practice memory and fine motor skills. Even though Mathesso is specially designed to be played by preschoolers who have not yet learned to read and write, older children and adults may find it very mind-opening too. However, for the effects mentioned earlier to occur, methodical procedures must be followed, and, above all, the game needs to be practiced regularly. The more active aversions in mathematics, the more effort it will need to eliminate them. The methodology development for identifying blockages in mathematics will be included in the forthcoming research.

Instead of teaching multiplication tables, parents can spend time with their children playing Mathesso. They may teach their children and even themselves incomparably more in less time. In the beginning, playing lighter variants with fewer jettons (the following section) is advised, and not be ashamed to use the color ruler whenever you lose confidence. The fewer jettons left on the table, the more parallel calculations occur. If a player gets lost in the rules, he can always switch to a simple memory game and navigate himself by jetton position. If a player finds the game too complicated, he can reduce the number of jettons to play with. After you overcome the initial uncertainty and perseverance, you'll discover that Mathesso is comparable to a chess game in its complexity. The beauty of Mathesso lies in its logical structure, working at the basic level of reasoning. Two times four equals eight, and no more profound thought or analogy is behind it. Thus, subconsciously, the source code of logical thinking is being tuned, and its effectiveness increases significantly. Mathesso works in the simplest possible way with the most complex phenomenon. Thinking (Drukarch, B., Holland, H., Velichkov, et al. (2018), He, K. (2017), Baggs, E., & Chemero, A. (2020), O'Keefe, P., Horberg, E., Sabherwal, A., Ibasco, G., & Binti Zainal, A. (2021)).

### **One of the game strategies**

In addition to the features described above, Mathesso can develop not only mathematical knowledge but also memory, strategic thinking, and perception of randomness to a great

extent. In this chapter, we will focus exclusively on the basics of where the development of the strategy may be heading.

In this game, a player will often find himself in a situation where he does not know or cannot remember even one face of jettons. It turns out that as early as the second game a player plays, he begins to think in these situations about which face number is best to flip to maximize the probability of successfully converting the second jettons.

As a first example, the initial state of the most miniature version of this game, namely Mathesso ATTO, is given for straightforward interpretation. From the graph, it can be seen (Figure 1) that it is most advantageous to flip the jettons with the number 1 (44%) followed by 5 (38%). In the game, this advantage is compensated by the fact that before the first turn, the players order is determined by flipping the jettons with 1, and the probability of the other numbers increases. Furthermore, the number 5 contains a prime number worth fewer points. Even this most miniature version of the game thus becomes balanced in terms of this strategy and opens up the possibility of using other techniques.

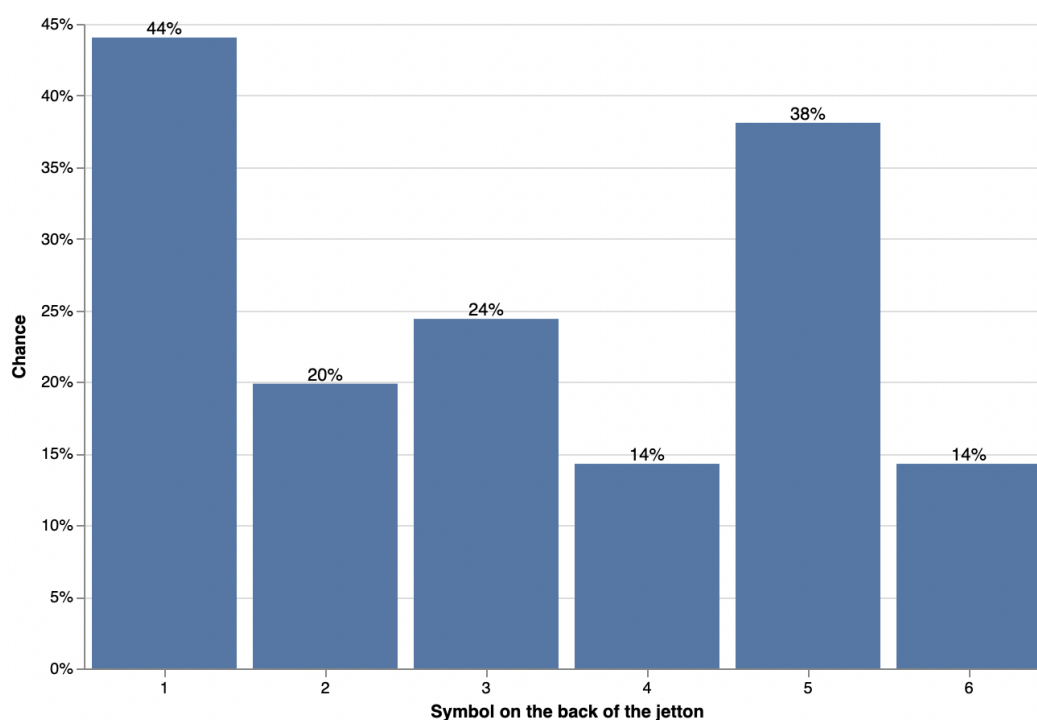


Figure 1: Probability of success when turning the first jetton according to the number on the white side of Mathessa ATTO jettons.

Another significant component is the probability of a successful move changes profoundly with each change. The following graph shows (Figure 2) how much the given probabilities can change when the previous player picks up only one pair of jettons. This shows that the game strategy can fundamentally change depending on which jettons are turned over initially.

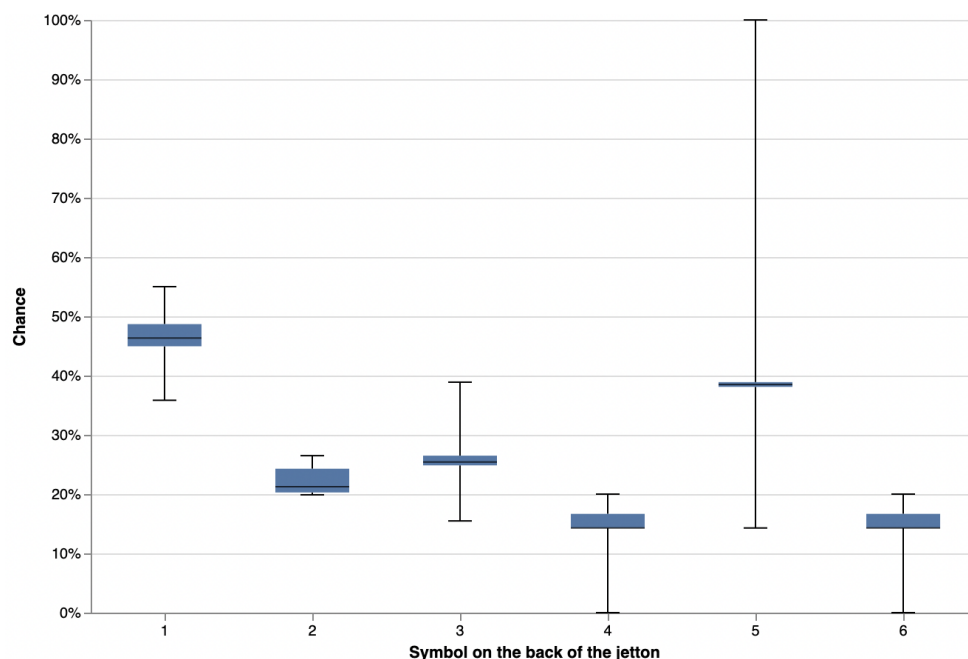


Figure 2: The Change of success when removing one pair from Mathesso ATTO.

This strategy is even more significant for Mathesso GIGA. As seen in (Figure 3), the knowledge of prime numbers, which are free to collect with this knowledge, pays off here. However, they are only for one point. On the other hand, factorial tokens (!) are worth 4 points, and they are represented with the lowest probability (6.2%) at the beginning of the game. Furthermore, the game is designed so that none of the most frequently occurring numbers have an advantage at the beginning of the game, as can be seen on the numbers 1 to 11, where the probability varies from 6.9% to 8.1%.

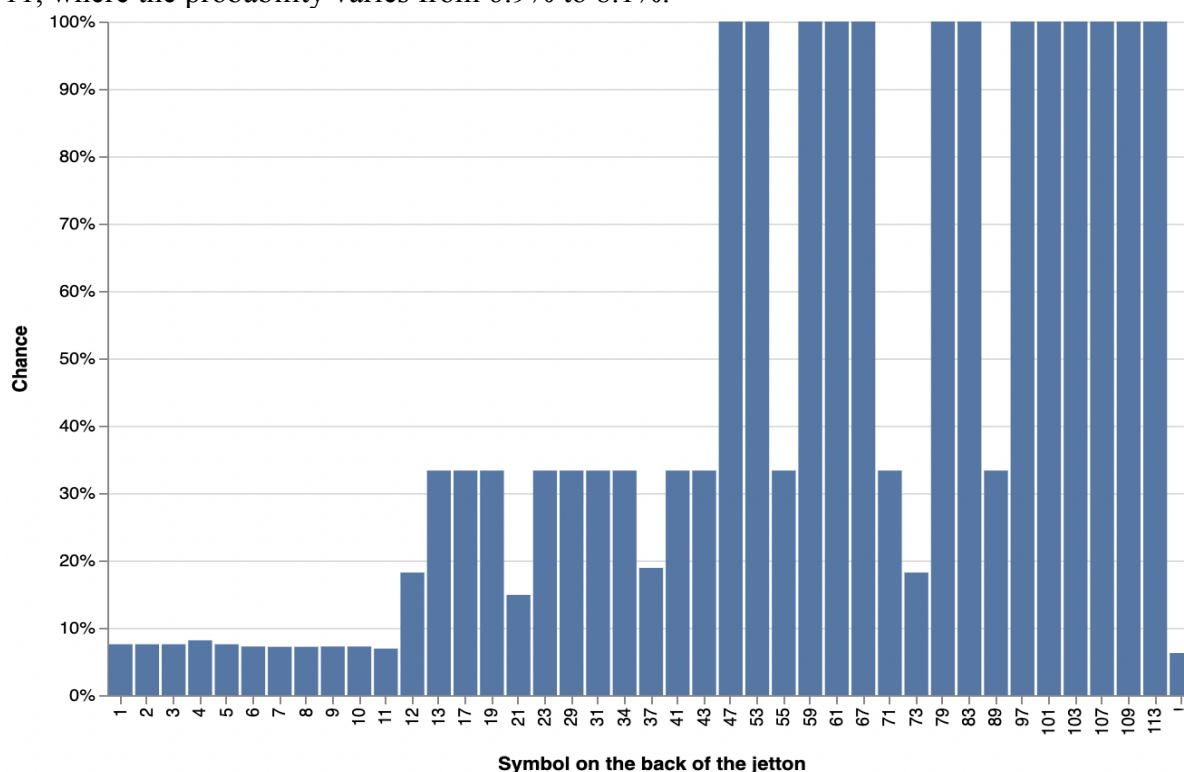


Figure 3: Probability of success when turning the first jetton according to the number on the white side from Mathesso GIGA.

## Teaching method

Mathesso is a game for teaching mathematics to children from 3 years old, adults, and university students. Therefore, the game is designed to have the lowest possible entry barrier (Schmidt-Jones, C. (2021;2022)) and, simultaneously, contain a high level of complexity. It is, therefore, possible to eliminate pairs of tokens from the game, depending on which mathematical property the player is learning. There are also a set of rules that can be followed depending on the age or agreement of the players.

Mathesso can be played in the same way as "Pexeso", "Pairs", "Memory", and "Concentration Memory Game" or also known as the "Pelmenism system" (Wilson, S., Darling, S., & Sykes, J. (2011)). So the game doesn't need to be explained in many cases. The rules can be summed up in a few sentences: "The jettons are laid out white side up. Players turn over a pair of cards so the other players can see them. If the flipped jettons have the same picture (color and number), the player takes them. If the cards are not the same, he turns them over. The next player in the sequence continues in the same manner. It is played until all the cards are taken apart. The winner will be the player with the largest number of found pairs."

With the "Pexeso" rules and without knowing the meaning of the numbers, the players can begin to see the connections and turn the correct jettons after a few short games. So that the game dynamic where players know how to use a ruler or know the multiplication table, prime numbers, and other types of tokens is preserved. Pairs of jettons are rated with points according to the difficulty of finding and game complexity.

- 0 points for each pair from group zero (black background).
- 1 point for each pair from the prime number group (yellow background).
- 2 points for each pair from the group of Fibonacci numbers (Dunlap, R. (1997)) (orange background)
- 2 points for each pair from the group small multiplication table (colored on a gray background)
- 3 points for each pair from the power group (colored on a circular background)
- 4 points for each pair from the group of factorials (Mingarelli, A. B. (2013)) (rainbow background)
- 5 points for each pair from group CJV (yellow-blue background)

When learning the multiplication table, the student is often confused about the fact that the number 16 is 2 times 8 and at the same time 4 times 4. This confusion can lead to further misunderstandings in the student's further studies. This game turns this phenomenon into an advantage with the rule of multiplying results from pairs of jettons with the same number. In the given case, the player has 2 points for 2 times 8 and 3 points for the power of 4. Therefore, this combination's resulting number of points is  $(2 + 3) * 2 = 10$  points. A student with this rule deliberately looks for such numbers and tries to pick them up. The opponent, on the other hand, tries to collect jettons with the same number.

One of the last recommended types of jettons is the "Cooper-Janečkova variety" (CJV) jettons. These tokens are the only ones that break the "pexeso" rules and are taken away if they only have the same background. At the same time, if the player picks up a combination of two, the jettons are worth 12 points, and the player has one extra turn at any time in the game. This jetton gives the game many possible strategies and even better game dynamics which will be described in detail in subsequent research and publication.

## Conclusion

The new board game Mathesso is built on the pelmasian principle connected to mathematical operations. The reverse synaesthesia as a learning mechanism (Ashok S. Jansari, Mary Jane Spiller, & Steven Redfern (2006), Simner, J., & Bain, A. (2018), Green, J. A., & Goswami, U. (2008), Gebuis, T., Nijboer, T. C. W., & Van der Smagt, M. J. (2009). Rinaldi, L., Smees, R., Alvarez, J., & Simner, J. (2020)), a system of unique colors, is used to imprint mathematical dependencies in the memory. In fact, the player does not even need to know the number symbols in order to play. Thanks to this, it is possible to learn multiplication, division, powers, prime numbers, Fibonacci numbers, factorials, and more in a non-violent method, just by playing this game. The forthcoming research will deal with creating a methodology for defining improvement, not only in mathematics but in diverse groups of people, especially in children of preschool age. The game has been preliminary tested (played) on individuals and modified to its current form with the help of feedback. Preliminary results at elementary schools in the Czech Republic show that after learning Mathesso, pre-school or first-grade school kids have a significantly more warm relationship with mathematics. Fundamental division and multiplication skills have been demonstrated without additional learning. In several cases, the kids understood the meaning of prime numbers purely by playing the game. Aversion to mathematics can be resolved for adult players by playing the game. In addition, Mathesso has been preliminarily found to significantly improve memory, strategic thinking, or the perception of randomness for several individuals.

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***Human Rights, Human Capital, and Capabilities as a Normative Basis for Social Justice and Sustainable Society Development. Sub Saharan African Countries a Viewpoint***

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**Abstract**

Corona Virus Diseases -19 (COVID-19) exposed high gaps of inequalities and social injustices that exists in societies. This raises questions into the adequacy of the existing human rights education frameworks to achieve the right to education to the end of achieving sustainable development and social justice in societies in general and in specific developing countries. This study submits the argument that the observed inequalities and social injustices provide evidence that the conceptualisation of education based on the human rights approach alone is insufficient to attain the rights to education and the goal behind this right. This conceptual paper thus assesses the grounds for an alternative conceptualisation that provide the right to education normative basis for achieving social justice, and sustainable development in societies. This paper begins with a discussion of the rights to education. A proposal is suggested to incorporate the human capital theory and the capabilities approach instead of discarding the human rights-based approach or leaving it to stand alone. The incorporation of the human rights, human capital, capabilities approach to the universal rights to education system will enrich the human rights-based education framework to provide a comprehensive perspective for attaining the normative basis for rights to education to promote the development of peoples' capacities to their full potentials, creation of conditions necessary for capabilities to be realised and the rights to be exercised. Such as an integrated education approach is envisaged contribute towards building sustained development and social justices in societies. Implications for practice, policy and theory are drawn.

**Keywords:** Right to Education, Human Capital Theory, Capabilities Approach, Sustainable Development, Social Justice, Sub Saharan African Countries

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## Introduction

This study examines the relationship between rights to education, human capital, and capabilities as a normative basis for achieving social justice and sustainable society development using Sub Saharan African countries as a viewpoint. This is because it is important to understand how the conditions in the society determine the ways through which education is converted into normative opportunities that create social justice and sustainable development. The concept of sustainable development is defined in the 1987 Report of the World Commission on Environment and Development (WCED) as a “development that meets the needs of the present without compromising the ability of the future generation to meet their own needs”. In pursuit of promoting sustainable development, the United Nations (UN) (2007) recognised eradication of extreme poverty and inequalities within and between countries as a requisite for creating and sustaining inclusive development. The UN (2015) in its Sustainable Development Goals (SDGs) reaffirmed and builds upon the previous sustainable development principles by proposing a new integrated approach towards building inclusive and sustainable growth in societies through a set of goals and targets that countries should strive to reach. The UN (2015) identified inclusive and equitable quality education and promote lifelong learning opportunities as Sustainable Development Goal 4 (SDG4). This indicated that education is expected to play a role that contributes to sustainable development and social justice in societies. As such, it is imperative to conduct a study that investigates how the rights to education can be augmented by the human capital theory and capabilities approach to create a normative basis for social justice and sustainable development. Insights from such a study may highlight supplementary principles that should be integrated in the existing rights to education approach to strengthen its contributions to sustainable development.

Presently, there are millions of people living in deplorable conditions and in great poverty, inequalities high level of unemployment, inadequate health services and lack of access to water in developing countries (World Bank, 2022). These conditions already existed before the rights to education was adopted to address and transform the society into one where human dignity, freedom and equality prevails. The continued appalling conditions observed indicates that, the aspirations of sustainable development through rights to education have not yet materialised. De Vos, Freedman, Brand et al (2014) describe the rights to conditions and resources for material wellbeing of people such as the right to things such as food, water, housing, education, health, and social assistance as social -economic rights. This indicates that, the scope of welfare rights that education is expected to address. This also suggests that the exercise of rights to education should be observed in conjunction of other rights to attain social justice and sustainable development. This suggests that the pursuit of right to education as conceptualised in the SDG4 alone might be insufficient to attain sustainable development without consideration of the contextual conditions. Against this backdrop it is important to investigate complementary approaches that may augment the right to education to become a normative for promoting social justice and sustainable development.

## Rights to education and sustainable development

United Nations Educational, Scientific and Cultural Organization (UNESCO) (2016) emphasised that whilst education is important like other SDGs goals such as health, growth, production, education however has the potential to accelerate the attainment of the other sustainable development goals and targets. UNESCO (2016) in the SDG4 identified seven targets that range from ensuring inclusive and equitable education to education for all.

genders, marginalised and vulnerable groups. The attainment of these seven targets is expected to enable education to the SDG4 is grounded on the principles of human rights, humanistic vision of education and development, based on the principles of human rights and dignity, social justice, peace, inclusion, and protection, as well as cultural, linguistic, and ethnic diversity and shared responsibility and accountability (UNESCO, 2016). It is evident that SDG4 targets seek to make use an integrative approach for sustainable development. Quality education is perceived as a foundational basis for achieving all the sustainable development goal suggesting that means that there is no sustainable development if there is no quality education. It thus means that if all people cannot get the opportunity to fulfil their full potential in dignity and equality then sustainable development is unlikely to be attained, that is, without the fulfilment of potentials of all people there are no possibilities of achieving sustainable development. As such it is imperative to find normative conditions that promotes sustainable development and social justice through the rights to education approach.

The vision and rationale of SDG4 as conceptualised by UNESCO (2016) highlight the important aspect of the ability to convert education into useful opportunities that promote inclusive intergenerational growth in societies among different generations. The conception for SGD4 is based on the affirmation of the principles of realisation of the human rights-based education approach (UNESCO, 2016). The human rights declaration in the UN Universal Declaration of Human Rights (UNUDHR) (1948) enshrined education as a fundamental right. Subsequently, several legal instruments such as International Covenant on Economic, Social and Cultural Rights of 1966 and the United Nations Convention on the Rights of the Child of 1989 promoted educational rights in their member states. In support of the human rights approach several efforts to increase access to education throughout the world were made. For instance, the Education for All (EFA) started by UNSECO that started in Jomtien, Thailand, 1990 and Dakar 2000 with the goal of achieving education for all by 2015. UNSCO (2007) describe the human rights-based approach to education as based on the aspiration of ensuring that every child has quality education that respects and promotes her or his right to dignity and optimum development. The goal of ensuring optimum development of every child through education demonstrates that, the right to education extend beyond promoting access to education and elimination of discrimination at different levels to promoting the unlocking of human capacities. The scope and focus of EFA was based on six goals that included expanding access to primary education, adult education, gender equality, quality education. Underlying each of the six goals was the respect and recognition of the right to education. It is imperative to note that conceptual framework for human rights-based approach was conceptualised and provided by UNESCO (2007) and it is constitutive of three aspects namely the right to access to education, the right to quality education and the right to respect in the learning environment

<b>1. The right of access to education</b>	<ul style="list-style-type: none"> <li>• Education throughout all stages of childhood and beyond</li> <li>• Availability and accessibility of education</li> <li>• Equality of opportunity</li> </ul>
<b>2. The right to quality education</b>	<ul style="list-style-type: none"> <li>• A broad, relevant and inclusive curriculum</li> <li>• Rights-based learning and assessment</li> <li>• Child-friendly, safe and healthy environments</li> </ul>
<b>3. The right to respect in the learning environment</b>	<ul style="list-style-type: none"> <li>• Respect for identity</li> <li>• Respect for participation rights</li> <li>• Respect for integrity</li> </ul>

Figure 1: Conceptual framework for holistic approach to education, reflecting the universality and indivisibility of all human rights. Source UNESCO (2007) a human rights-based education approach to Education for All.

Table 1 shows the elements that should be addressed for human rights to education to be realised. The right to access focuses on ensuring that education from childhood and beyond availability, and accessibility and equal opportunity. The right to quality education focuses on the broad, relevant, and inclusive curriculum, rights bases learning and assessment, health and safety environment. Lastly the right to respect in the learning environment involves the respect for identity, respect for integrity and many others. The SDG4 builds upon the previous progresses of EFA and Millennium Development Goals (MDGs). McCowan (2011) argues that mere provision of entitlement to a right does translate to the realisation of the rights. This suggest that supplementary ways of ensuring that the right to education are realised should be explored, vision of development of full capacities of every learner. This is because it is evident that the conceptual framework the right to education does not directly include principles human capital, social justice and sustainable development.

### **Rights to education linkages to human capital, social justice.**

According to the World Bank (2018, 42) quality education fosters creativity, knowledge and ensures the acquisition of the foundational skills of literacy. Numeracy, analytical, problem-solving skills, a high-level cognitive, interpersonal, and social skills. The World Bank (2018) further explain that education develops the skills, values and attitudes that enable citizens to lead healthy, fulfilled lives, make informed decisions, and responsiveness to the local and global challenges through education for sustainable development (ESD) and global citizenship education (GCED). It can be deduced from these views that there are significant linkages between human capital, human rights, and capabilities. It means that, if necessary, conditions are created education can lead creation of sustainable societies. Olaniya and Okeminde (2008) describe education as a productive investment in human capital, which provides a ground for ensuring that everyone gets an equal opportunity to contribute to their own self development and that of the society as access to opportunities and resources available in the society. Gilles (2015) asserts that the human capital theory considers education as an investment that yield return to the individual in terms of income through salary and wages to the state through employment and economic growth. The human capital approach assumes that accumulated stock acquired from education and training has economic benefits to both the individual and the society. Education reduces poverty substantial reductions in the income gap between households across the income distribution (World Bank, 2018). Requestion of poverty and inequalities are essential elements of social justice. UNESCO (2016) elucidated that better education is central to promoting inclusion of people

from the marginalised groups such as persons with disabilities, girls, women, adults, and those whose lives might have been devastated by crisis and conflicts. It can be inferred from these views that education is an internal process that promotes human capital development and equal opportunities to participate in economic activities. This indicates that human rights, capability and human capital approaches share the common principles of development of the capacities and talents of every human being for the betterment of both the self and society. The right to education provides a legal entitlement to education to with the view of providing equal opportunities to develop abilities to enjoy the individual freedoms and rights.

	Individual/family	Community/ society
<b>Monetary</b>	Higher probability of employment Greater productivity Higher earnings Reduced poverty	Higher productivity More rapid economic growth Poverty reduction Long-run development
<b>Nonmonetary</b>	Better health Improved education and health of children/family Greater resilience and adaptability More engaged citizenship Better choices Greater life satisfaction	Increased social mobility Better-functioning institutions/service delivery Higher levels of civic engagement Greater social cohesion Reduced negative externalities

Table 1: Benefits of education to the individual and society Source World bank Team 2018

Findings in table 1 shows that education consist not only of individual monetary but also of community benefits to the society. The findings by the World Bank (2018) indicated that the societal benefits of education range from monetary to the individual, family, community, and society. For instance, the table shows that monetary benefits to the individual include amongst other things higher earnings, greater changes of getting employment, reduced poverty as well as non-monetary benefits such a good health, better education and health for the society and more engaged citizenship. At community level education has several monetary benefits such as higher productivity, economic growth and long run development and non-monetary community and social benefits such as increased social mobility, greater social cohesion and reduced negative externalities. World Bank (2018) concluded that education is an instrumental tool for realisation of fundamental rights, dignity, and freedoms. Widarni and Wilantari (2021) affirms that education plays an important role in developing the community through empowering the productivity abilities that uplifts the individual and society. These recent findings assert the conclusion drawn in Olaniya and Okeminde (2008) that only quality education has the capacity to contribute meaningfully to economic growth thereby reducing poverty, unemployment, and other social economic ills. Education rights facilitates the attainment of social justice by granting everyone an equal opportunity to realise their rights to their capabilities through education. This demonstrates that the realisation of the right to education has significant influence on most if not all fundamental human rights. This means that violation of rights to quality education that creates human capital is infringement on human dignity in terms of limiting their abilities to derive individual monetary and non-monetary benefits which may potentially spill over to community and society benefits

This view affirms the human capital perspective that education leads to realisation the fundamental rights and freedoms. Human capital perspective argues that economic social development is dependent on the stock of skills that is created from education systems with a country (Matashu and Skehphe, 2022). On these grounds education is deemed to generate

great economic and social benefits for both the individual and society. Despite highlighting the relationship between education rights to education and human capital development these frameworks do not extend to consider the influence of conditions societies that determine how the teaching and learning is created into opportunities.

### **Rights to education, capabilities, and sustainable development**

Education in conception is understood to save the purpose of developing individual human capacities to the full potential through acquisition of specific skills, competences, abilities, values, and knowledge (Matashu, 2022). In this regard, the EFA, MGDs and SDGs framework aimed to fulfil the entitlement to education for all. However, despite the increased access to education developing countries these economies appear to struggle to stimulate economic growth through increased investment in education, yet it appears extreme poverty and inequalities continues to increase. Arguably, the conceptualisation of the right to education framework is insufficient to capture the realisation of the goal of the sustainable, that is to promote intergenerational prosperity in countries. This study thus introduces the capabilities approach to extent the right to education and human capital theory to enhance its normativity towards attaining social justice and sustainable development. Nussbaum (2000) and Sen (2004, 2005) argue that the realisation of the entitlement to education into practice was a challenge. McCowan (2015) explains that rights are limited to creating a fulfilment of legal obligation consequently this approach focuses on the narrow interpretation of the rights. This narrow scope approach to the interpretation of rights focuses on enforcing compliance to the legal obligation and does not extend to evaluate the implementation and achieved of outcomes. The study does not however discard the human rights approach but rather introduce alternatives approaches to address its inadequacies.

To start with the human rights approach provides the state with the legal obligation to fulfil the right to education as well as the need to provide its financing as much it must be provide the basis for conceptualisation of education. The rights-based education approach affirms the entitlement enshrined in the universal declarations of principles of indivisibility, interrelatedness, and independence of human rights (McCowan, 2011). These elements safeguard the rights to education through legislation as well as distinguishes the nature of the right. McCowan further elaborates the interdependence of the human rights-based education through three ways namely, the right to education that is the access aspect, rights in education as representing the learning environment and the rights through education that is development of capabilities for exercising the human rights. The human rights to education approach thus integrate the aspirations of the sustainable development approach in seeking to promote quality education that unlocks the intellectual potentials of the individual and society at large. This means that the right to education should not be considered as standing alone rather they must be understood in conjunction with other rights. The rights education framework as discussed above seems to suffer from deficiencies by mere focus on entitlement to education without incorporating the welfare rights and condition that embodied in the sustainable development approach.

Sustainable development is a global transformative development approach that seeks to eradicate poverty and inequalities within countries, to create peaceful, just and inclusive societies that protect human rights and dignities to ensure a sustainable protection of the planets and its resources. Within the same frames the sustainable development approach aimed to build conditions for sustainable, inclusive, and sustained economic growth and shared intergonial economic stability for all taking into cognisance the different levels of



national development and capacities (UN, 2015) While the idea of sustainable development has considerable merit in the conceptualising aspects of social justice, it cannot adequately address the processes aspects of social justice since sustainable development is characterised by aspiration for international development, it falls short telling us about the connections between education, human capital development and capabilities conditions that should exist to create a sustained economic growth. Oftentimes overlooked is the condition of sustainable development goal and targeted provided for at paragraph 55 of the UN 2015. Sustainable development should take into consideration that:

The Sustainable Development Goals and targets are integrated and indivisible, global in nature and universally applicable, considering different national realities, capacities and levels of development and respecting national policies and priorities. Targets are defined as aspirational and global, with each Government setting its own national targets guided by the global level of ambition but considering national circumstances. Each Government will also decide how these aspirational and global targets should be incorporated into national planning processes, policies, and strategies. It is important to recognize the link between sustainable development and other relevant ongoing processes in the economic, social, and environmental fields.

It is evident that, the above statement underscores the need to consider the contextual conditions which should exist for SDGs to be achieved. This implies that the rights to education are inadequate if the conditions that enable the rights to be exercised are not created. Given the inherent narrow perspective of the human rights approach it is important to expand it to ground it on broader conceptions of rights to embody the need for a sustainable societal development as envisaged by the SDGs. To ensure the rights to education leads to realisation of the sustainable development approach there is need to integrate the welfare rights that include human capital, capabilities, and social justice. Nussbaum (2007) in the capabilities approach proposed the need to develop conditions that enable people to develop their capabilities to function in key areas of critical importance (valued functionings). Nussbaum (2007) prescribes ten conditions that must not fall below a targeted threshold to ensure the development of all human being's capabilities. These capabilities consist of intrinsic and external capabilities such as life, bodily health, bodily integrity, and affiliation (Nussbaum 2000). McCowan (2015) argues that the capabilities approach provides an alternative framework for the implementation of rights to education instead of over dependence on the state obligations. McCowan (2015) elucidates the capabilities approach supplements the rights approach postulating that the right to capabilities can be discussed and enacted at different levels. In this regard the concept of capabilities needs to be introduced to the rights to education approach to enable education to fulfil the duty and responsibility of developing human functionings within different layers of the society. This indicates the need to further the mutual relationship between education, human capital, capabilities, and social justice.

Emphasising the human rights as the default framework for realising the rights, Nussbaum (2000, 2007) assign the government the duty and obligation to ensure the fulfilment of the rights and creating conditions that enable the rights to be realised. This implies that, the infringement of the rights to capabilities would deter the development of the key functionings that are necessary for all human being to have equal ability to enjoy their fundamental rights. The capabilities approach highlights the understanding of condition in which the rights to education is implemented as necessary for realisation of the recognised rights. Widarni and Wilantari (2021) points out that increases in the productivity of society

results in an increase in the gross domestic product and subsequently this is translated to increased performance of the communities within a nation. It can be deduced that human capital promotes economic growth and development, which subsequently translates to employment, poverty reduction and improved overall national wellbeing. In this regard the capabilities approach does reinforce the need create conditions that enable not only recognition of the rights to education as both an entitlement and moral claim for corresponding rights but also the realisation of these rights.

### **Implications for practice, policy, and theory**

The tropical debate on economic growth, human capital and social justice is of special significance for developing countries. Developing nations are striving to stimulate economic growth through increasing investment in education yet it appears extreme poverty and inequalities continues to increase. The human rights-based education approach is rounded on the entitlement of education as fundamental human right it entails that those countries should uphold the rights to education as instrumental for the realisation of the fundamental human rights and freedoms. The human capital perspective argues that economic social development is highly dependent on the stock of skills that is created from education systems with a country. On these grounds education is deemed to generate great economic and social benefits for both the individual and society. However, what has been overlooked in the rights to education is the right to capabilities that must be intrinsic to the goal of the right. The capabilities perspective argues the need to positive welfare rights as threshold conditions for all human being as significant for attainment for human rights. Nussbaum (2007) recognises education as part of the welfare rights where a threshold should be reached for all human being such that infringement does not occur, thus giving it a moral claim. Capabilities approach provides a metric for measuring human development as based on 10 capabilities that must be realised for all human being for their rights not to be infringed. This entails in practice policy makers should ensure that conditions which influence the impact realisation of the rights to education should be identified and addressed jointly in promotion of acquiring quality education. The implications for theory are that the human rights to education should be supplemented by human capital, capabilities, social justice for sustainable development to be recognised.

### **Conclusion**

Taken together, all matters discussed in this study leads to the argument that without addressing the issues of capabilities it is impossible for rights to education to contribute to human capital and economic development. This suggest that, the right to education should be realised in conjunction with the other welfare rights. It thus indicates that education framework should be extended to incorporate the principles of the capability approach. Although the capabilities approach does recognise the development of valuable functionalities as instrumental to the attainment of human rights it does not capture the human capital development principles. This indicates that human rights and capabilities approach needs to be extended with the human capital approach in order to lead to social justice and sustainable development in societies. As can be seen above the intersection between the human rights-based education, human capital and capabilities creates conditions that promotes the attainment of social justice.

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### ***Orphans and School Vulnerabilities in Selected States in Nigeria***

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#### **Abstract**

This study investigated the issues that relate with schooling of orphans in Nigeria. The descriptive survey research was undertaken in Lagos, Osun, Akwa Ibom, and Abuja. Sampling was done in multi-stages. A validated questionnaire was administered to collect data using Open Data Kit (ODK). Orphans aged 10-17 years, resident in orphanages and family settings, participated in the study. Data collected were analysed using descriptive statistics. Results showed that about 240 orphans in family settings and 48 in orphanages are not in school. It was also discovered that 625 orphans in family settings and 680 in orphanages did not complete their primary school education. Furthermore, orphans in family settings 824 and 576 in orphanages did not attend secondary schools. So also 790 in family settings and 496 in orphanages did not complete their secondary school education. It was noted that about 499 orphans in family settings and 72 in orphanages occasionally miss school and the reasons given were house chores, economic activity such as hawking, labour work, sickness, lack of learning materials and non-payment of school fees. In addition, some of the orphans in family settings (315) and 146 in orphanages are not happy with their performance in school and 223 in family setting and 109 in orphanages believe they are below average in class. It was therefore recommended that government, development partners and various organisations should come up with aids and intervention programmes that can assist orphans' schooling irrespective of residential placement.

Keywords: Orphans, Schooling, Enrolment, Challenges, Orphanages

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## Introduction

Nigeria is the most populous country in Africa with over 206.1 million people as at 2020 and it is about 2.64% of the world's population. Nigeria also has a young population structure, with children and young people under the age of 25 years constituting more than 60% of the population and among this population are the orphans. As indicated in the Nigerian National Population Commission (NPC) 2004 documentation, the 2003 Nigerian Demographic and Health Survey (NDHS) showed that 6 percent of children under the age of 15 had lost at least one parent while less than 1 percent of children had lost both parents. The prevalence of orphan-hood was highest in the South East where 11% of children had lost one or both parents. The provisional findings of the 2007 Multiple Indicators Cluster Survey (MICS) similarly reported that 6.1% of males and 6.5% of females under the age of 15 years and 10.5% of males and 10.7% of females under the age of 18 years were orphans in Nigeria. In 2007, 6.1% of male orphans and 6.5% of female orphans were recorded as not living with any biological parent. In 2010, the population of orphans and vulnerable children in Nigeria was estimated at 17.5 million (USAID, 2010). Not long after this time, series of clashes and wars were experienced in different parts of the country - militants' clashes in the Niger-Delta region, insurgency in most of the North-eastern states and Fulani herdsmen/farmer clashes in the North Central. All these crises no doubt keep the population of the orphans increasing in the country.

In most countries today, full-time schooling is compulsory for all children up to a certain age. The Nigerian educational system for children under the age of 18 years is implemented both at the basic and senior secondary education levels. The basic education component as defined in the Universal Basic Education (UBE) comprised early childhood education, primary education, junior secondary education and non-formal education. The National Policy on Education (2004) encapsulates Nigeria's philosophy of education, which is based on the provision of equal access to educational opportunities for all citizens of the country at the primary, secondary, and tertiary levels both inside and outside the formal school system. The policy mandates compulsory, free basic education (nine years of schooling, comprising six years of primary education and three years of junior secondary school education) which is backed up by the Universal Basic Education Act, 2004 (UBE Act). The Act is Federal Government's intervention to provide assistance to states and local governments in Nigeria for the purposes of uniform and qualitative basic education through equitable access to education.

Many studies have focused on impact of parent/s death on education of orphans. While a study observed the likelihood of orphans to suffer low enrolment in schools and low completion rates (*Case, Paxson, and Ableidinger 2004*) other studies discovered no impact of parental death on education of orphan (Ainsworth, Beegle, and Koda 2005; Kamali et al. 1996; Lloyd and Blanc 1996; Ryder et al. 1994). Orphans' accessibility to education is of utmost concern because when children, especially orphans are left vulnerable, they are at risk of abuse, criminal vices and violent behaviour. Education has major impact on behaviour and there is an increased recognition of the role of education in human development and national growth. It is expected that if orphans are educated they are less likely to contribute to the economic burden of the nation. Not only that, the education acquired will equip them with skills to contribute positively to the growth and development of the country. Based on all the above narratives, it is expedient to find out the challenges associated with the schooling of orphans in Nigeria. The information

obtained from this research will provide data for guiding the reform of orphan's welfare and their protection. It will also guide policies and programmes towards the Nigeria's commitment to achieving the SDG goals by 2030 in ensuring that all girls and boys complete free, equitable and quality primary and secondary education.

Therefore in this study two objectives were developed which are to:

1. identify the issues related to schooling of orphans in family settings and orphanages in Nigeria
2. analyse the barriers/challenges to effective schooling of orphans both in family settings and orphanages in Nigeria

In order to explore these further, the following research questions were generated:

1. Do orphans in family settings and orphanages go to school?
2. How many of the orphans that attended school completed their basic education?
3. What are the risk factors to orphans' drop out and in-completion of basic education in family settings and orphanages?

The study employed descriptive survey research design. The target population comprised orphans in formal settings (orphanages) and informal care (family settings) in selected states in Nigeria. The sampling was undertaken in multi stages. At the first stage, 4 states were selected purposively using indices of insurgencies, HIV/AIDs and tribal clashes as basis for selection. The chosen states are Lagos, Osun, Akwa Ibom, and Federal Capital Territory, Abuja. At the second stage, two Local Government Areas (LGA) that have orphanages were purposively chosen, the list of orphanages in each state was collected from the state ministry in charge of orphanages. In each orphanage chosen, orphans between ages, 10-17 years participated in the study. At the family settings, snowball sampling technique was adopted in selecting the orphans. Only orphans who met the criteria for inclusion and who agreed to participate in the study were involved. To capture the detailed experiences of the orphans in the family setting, handheld electronic devices with the open data kit (ODK) installed on it were used. This approach minimised errors in data collection and entry. It also helped in collecting Geographical Positioning System (GPS) information which served as part of the quality assurance and also provide spatial data for geo-referencing of findings. Questionnaires for collection of quantitative data was designed, pre-tested and validated for use. Research assistants were trained and commissioned for data collection. Data collected were analysed using item by item percentages.

Research Question 1: Do orphans in orphanages and family settings go to school? The results are presented in the table 1 below:

Table 1: Showing Primary and Secondary School Orphans' School Attendance

	Family Settings				Orphanages			
	Yes		No		Yes		No	
	n	%	n	%	n	%	N	%
Are you presently in school?	1596	86.9	240	13.1	1291	96.4	48	3.6
Did (do) you attend primary school?	1770	96.4	66	3.6	1298	96.9	41	3.1
Did (do) you attend secondary school?	946	53.4	824	46.6	723	55.7	576	44.3

Source: Field Data and Report 2021

The results above showed that most orphans in family settings and orphanages are in school, (Family settings 1596 and Orphanages 1291) however there are still about (240 in family settings and 48 in orphanages) who are not in school. Most of the orphans in family settings 1770 and orphanages 1298 attended primary schools. However in the family settings, 66 did not attend primary school and 41 did not attend in orphanages. It was discovered that in family settings 1145 completed primary schools and 618 also completed in the orphanages. 625 did not complete their primary education in family settings while 680 did not complete theirs in orphanages. Furthermore, orphans in family settings 946 and 723 in orphanages attend secondary school. 824 in family settings and 576 in orphanages did not attend secondary schools.

Research Question 2: How many of the orphans completed their basic education?

The results are presented in table 2 below

Table 2: Showing Completion of Primary and Secondary School by Orphans

	Family Settings				Orphanages			
	Yes		No		Yes		No	
	n	%	N	%	n	%	n	%
Did you complete your primary education?	1145	64.7	625	35.3	618	47.6	680	52.4
Did (do) you complete your secondary education?	156	16.5	790	83.5	80	13.9	496	86.1

Source: Field Data and Report 2021



The above results showed that 625 orphans in family settings and 680 orphans in orphanages did not complete their primary school education. In addition, 790 orphans in family settings and 496 in orphanages did not complete their secondary school education.

Research Question 3: what are the vulnerability factors for orphans' completion of basic education in family settings and orphanages?

The results are presented in Tables 3 – 9.

Table 3: Showing Orphans Satisfaction with Performance at School

<b>Are you happy with your performance in school?</b>							
Family Settings				Orphanages			
Yes		No		Yes		No	
N	%	N	%	N	%	N	%
1281	80.3	315	19.7	1152	88.8	146	11.2
<b>Rate your performance in relation to your class mates</b>							
Family Settings				Orphanages			
	n	%		N	%		
Above average	532	33.3		520	40.1		
Average student	841	52.7		669	51.5		
Below average student	223	14		109	8.4		

Source: Field Data and Report 2021

Most of the orphans in family settings (315) are not happy with their performance in school and 223 believe they are below average in class. In the orphanages, 146 orphans are not happy with their performance and 109 believed they perform below average in class. Most of the orphans are satisfied with their performance in school however 19.7 % in family settings and 11.2% in orphanages are not. Also 14% in Family settings and 8.4% in orphanages rated themselves below average in relation to their classmates.

Table 4: Orphans Experience with Living with Caregivers

Do you think living with your caregiver is affecting your performance in school?	Family settings				Orphanages			
	Yes		No		Yes		No	
	n	%	n	%	n	%	n	%
	512	32.1	1084	67.9	378	29.1	920	70.9
If yes, in what direction?	Positive		Negative		Positive		Negative	
	n	%	N	%	n	%	n	%
	327	63.9	185	36.1	340	89.9	38	10.1
If negative, in what way?								
	Yes (n)		%		No (n)		%	
1. Often get late to school	44		23.8		4		10.3	
2. Sometimes miss school	31		16.8		5		12.8	
3. Not being able to complete assignment	14		7.6		11		28.2	
4. Poor performances in exams	45		24.3		16		41	
5. Unable to pay school fees	51		27.6		3		7.7	

Source: Field Data and Report 2021

The results above indicated that most orphans believed that living with their caregivers is not affecting their performance in school. It was noted that many of the orphans in family settings (1084) did not feel living with their caregivers affected their performance in school so also 920 in orphanages. However 512 orphans in family settings and 378 in orphanages believed living with their caregiver affected their performance in school and 185 in family settings and 38 in orphanages feel it is in the negative direction. Also 36.1% and 10.1% of the orphans in family settings and orphanages respectively feel that living with their caregivers have affected them negatively, such that they often get late to school, sometimes miss school, not being able to complete assignments, poor performances in exams and being unable to pay their school fees.

Table 5: Orphans' Accessibility to Time to Study

Do you get enough time to study at home after school?	Family settings				Orphanages			
	Yes		No		Yes		No	
	n	%	n	%	n	%	n	%
	1252	78.7	339	21.3	1210	94.1	76	5.9
If no why?	Family settings				Orphanages			
	Yes (n)		%		Yes (n)		%	
1. House chores	144		42.5		41		54	
2. Economic activity such as hawking, labour work, etc	125		36.9		3		4	
3. Power outage	13		3.8		7		9.2	
4. Lack of learning materials	46		13.6		10		13.2	
5. Others, specify	11		3.2		15		19.7	

Source: Field Data and Report 2021

Results from table 5 above showed that most orphans do get enough time at home to study, however those who do not were hindered because they had to do house chores and economic activity such as hawking and labour work. Some of them were also hindered by power outage and lack of learning materials. It was noted that 76 orphans in orphanages and 337 in family settings do not get enough time to study at home after school. This is due to issues such as house chores, economic activity such as hawking, labour work, power outage and lack of learning materials.

Table 6: Orphans' Experience with School Assignment

Do you always do your school assignments alone?	Family settings				Orphanages			
	Yes		No		Yes		No	
	N	%	N	%	N	%	N	%
	1087	68.1	509	31.9	784	60.4	514	39.6
If no, from whom do you seek assistance?	Family settings				Orphanages			
	N		%		n		%	
	Neighbours		88		17.3		3	
	Class mates		72		14.2		32	
	Other members of the household		258		50.7		295	
	Home teacher		18		3.5		52	
	Caregivers		72		14.2		128	
	Others		1		0.1		4	

Source: Field Data and Report 2021

From the results, it was revealed that most of the orphans 1087 in family settings and 784 in orphanages do their school assignments alone and without assistance. The challenge was more for orphans in family settings than orphans in orphanages. However 31.9% and 39.6% in family settings and orphanages respectively do not do school assignments alone. They were able to get assistance from neighbours, class mates, other members of the household, home teacher and caregivers.

Table 7: Orphans' Challenge with Getting to School Early

Do you sometimes get late to school	Family settings				Orphanages			
	Yes		No		Yes		No	
	N	%	N	%	N	%	N	%
	624	39.1	972	60.1	300	23.1	998	76.9
	Family settings				Orphanages			
If yes, how often does this happen?	n		%		n		%	
Very often	84		13.5		19		6.3	
Occasionally	323		51.8		117		39	
Rarely	214		34.3		160		53.3	
Never	3		0.5		4		1.3	
Why do you get late to school?	Family settings				Orphanages			
1. House chores	295		47.3		125		41.7	
2. Economic activity such as hawking, labour work	76		12.2		5		1.7	
3. Waking up late	192		30.8		87		29	
4. Lack of learning materials	12		1.9		1		0.3	
5. Other, Specify	49		7.9		82		27.3	

Source: Field Data and Report 2021

Results from table 7: showed that orphans sometimes get late to school due to house chores, economic activities, waking up late and learning materials

Table 8: Orphans' Challenge with Having to Miss School

Do you sometimes miss school?	Family settings				Orphanages			
	Yes		No		Yes		No	
	N	%	N	%	N	%	N	%
	499	31.3	1097	68.7	231	17.8	1067	82.2
		Family settings			Orphanages			
If yes, how often does this happen in a term?								
1. Very often		43		8.6		6		2.6
2. Occasionally		230		46.1		72		31.2
3. Rarely		223		44.7		152		65.8
4. Never		3		0.6		1		0.4
5. Why do you miss school?								
6. House chores		165				41		
7. Economic activity such as hawking, labour work		95				4		
8. Sickness		225				149		
9. Lack of learning materials		80				6		
10. Non-payment of school fees		154				9		
11. School bullying		2				2		
12. Stigmatization by school mates		3				0		
13. Shame of being an orphan		5				0		
14. Exclusion from school activities		10				5		
15. Other, Specify		41				49		

Source: Field Data and Report 2021

Results above showed that some orphans miss school for various reasons among which are sickness, non-payment of school fees, economic activity such as hawking, labour work and house chores. However economic activity and house chores are more in family settings than orphanages. It was noted that about 499 orphans in family settings occasionally miss school and the reasons given were due to house chores, economic activity such as hawking, labour work, sickness, lack of learning materials and non-payment of school fees. So also in orphanages, about 72 orphans occasionally miss school and those who have ever missed school do so because they were sick 149 and because of house chores 41.

Table 9: Stakeholders Involvement with Orphans' Care

	Family Settings		Orphanages	
Who pays your school fees? (for those attending school)	Number (n)	%	Number (n)	%
1. Self	14	0.9	0	0.0
2. Caregiver	979	61.3	985	75.9
3. Neighbour	3	0.2	-	-
4. NGOs/CBOs/FBOs	10	0.6	172	12.7
5. Government	103	6.5	60	4.6
6. Philanthropists	13	0.8	60	4.6
7. Other family members	78	4.9	7	0.5
8. Others Specify	396	24.8	-	-
Who pays for other school materials? (e.g. books, pen, school uniforms, shoes etc.)				
1. Self	32		1	0.1
2. Caregiver	1069		1008	77.7
3. Neighbour	13		1	0.1
4. NGOs/CBOs/FBOs	13		162	12.5
5. Government	44		46	3.5
6. Philanthropists	18		61	4.7
7. Other family members	80		6	0.5
8. Others Specify	446		13	1

Source: Field Data and Report 2021

The result above showed that in the family settings it is the caregiver who pays orphans' school fees 979 while 103 of the orphans have their school fees paid by Government. So also in orphanages it is the caregiver who pays the school fees of 985 orphans, non-Governmental organisations/Community Based Organisations/Faith Based Organisations pays for 172 while 60 of the orphans said their school fees is being paid by the government and Philanthropists.

## **Conclusion**

It is well known that the extent to which the basic needs of children are met especially at their developmental stage plays significant roles in their quality of life. When children are deprived the basic needs, there are tendencies for vulnerabilities. The results of this study has shown that whether family settings or orphanages, there is failure in the ability of families or orphanages to meet some of the needs of some of the orphans in their care. This may be due to poverty, increase in population of orphans and reduced number of care givers in the settings investigated. As reported, orphans and vulnerable children are finding it increasingly difficult to be incorporated into the extended family safety net (Foster, 2010) and these children are more prone to ill health than children in more secure circumstances, they have less access to health care and miss meals more frequently and are more likely to skip school or not go to school at all (Tagurum, Childan, Bello, Afolaranmi, Hassan, Iyaji & Idoko, 2015). The ability of these children to continue in school would largely depend on households' resources and the public support for education (Bhargava & Bigombe, 2003).

It was therefore recommended that irrespective of residential placement, government, development partners and various organisations should come up with more aids and intervention programmes for the minority orphans that are yet to secure quality schooling and resources. This is necessary so as to reduce some of the challenges faced.

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