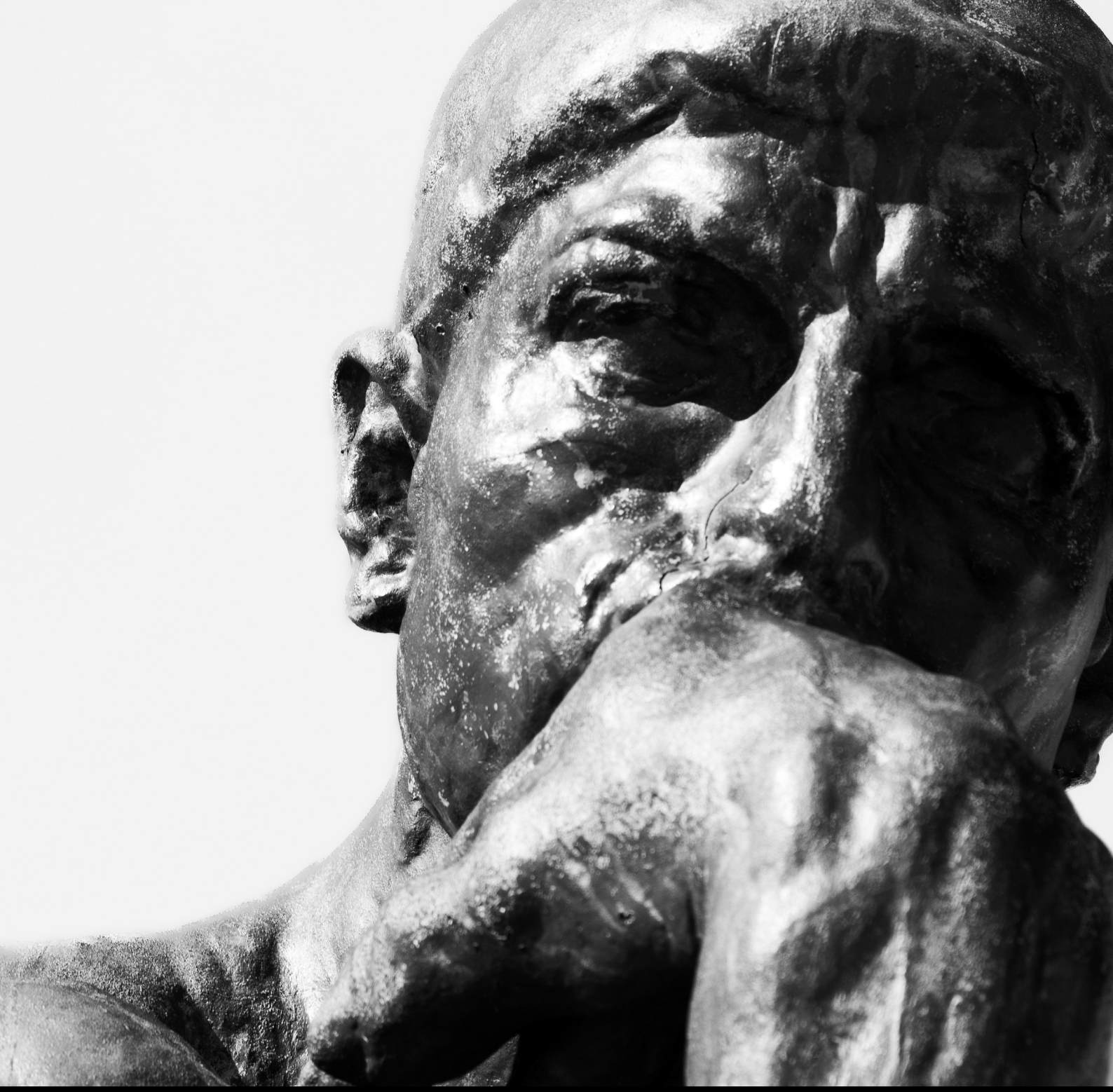

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Digital Textbooks as Mediating Cultural Tools: A Sociocultural Study of Seoul's Transnational Educational Initiative

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Abstract

In 2025, the Seoul Metropolitan Office of Education introduced the "International Educational Exchange Activation Project," providing over 140,000 Korean-language e-books and audiobooks to twenty-six overseas Korean Education Centers. While this project substantially broadens access to Korean language and cultural resources abroad, the long-term impacts on heritage learners and international students engaging with these digital materials remain insufficiently examined. Without recognizing how these resources mediate social and cultural learning, stakeholders risk limiting learners' ability to fully engage, acquire language skills, and develop global competencies. By applying Vygotsky's Sociocultural Theory, this study conceptualizes digital textbooks and e-books as mediating cultural tools that scaffold development within socially and culturally embedded contexts. The research employs a qualitative case study of policy structures and institutional practices, tracing how digital resources circulate from Seoul's producers to overseas education centers and learners in diaspora and international communities. The focus is on structural and symbolic dynamics rather than individual usage patterns, emphasizing the distinctive role of a municipal authority in leading educational exchange, as opposed to conventional state-led or institution-based models. This study explores how digital mediation may support heritage language retention and equitable access cultural knowledge. This study further investigates whether such initiatives can strengthen learners' identities and provide international students with opportunities for cultural and linguistic engagement. More broadly, the Seoul case examines whether municipal-level digital initiatives can operate transnationally, offering a replicable model of public education that promotes global citizenship, intercultural understanding, and educational collaboration under SDG 4 on inclusive and equitable quality education.

Keywords: digital mediation, heritage language learning, paradiplomacy, transnational educational exchange

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Introduction

The commitment to inclusive and equitable quality education under Sustainable Development Goal 4 has widened the meaning of educational access. Providing a place in school is no longer sufficient when learners remain unable to participate meaningfully because of geographical distance, language, cultural disconnection, or unequal access to educational resources. Education also shapes how people understand their social worlds and maintain relationships with the communities and cultures to which they belong. Educational development increasingly concerns the conditions that allow learners to participate in learning over time and across different social settings (United Nations, 2015).

This broader understanding developed through earlier international education agendas. The Education for All movement and the Dakar Framework highlighted the learning needs of children, young people, and adults, while the Sustainable Development Goals placed stronger emphasis on equity, inclusion, quality, and lifelong learning (UNESCO, 2000; United Nations, 2015). The existence of educational resources does not necessarily mean that learners can use them in meaningful ways. They may remain distant from the linguistic and cultural environments of the people they are intended to serve, particularly for heritage language learners and international students whose learning crosses national, linguistic, and cultural boundaries.

Digital technology has altered some of the conditions under which educational access can be organized. Information and communication technology can connect learners with materials, institutions, teachers, and educational networks beyond conventional classrooms. International development research has consequently treated ICT as a means of extending educational opportunities across geographic and social barriers (Asian Development Bank, 2003; UNESCO Institute for Statistics, 2009; World Bank Group, 2003). Yet technological availability does not guarantee educational inclusion. Digital resources remain dependent on the institutional and cultural contexts in which learners encounter and use them.

This issue is particularly relevant to heritage language education. Heritage learners often engage with languages that hold personal and cultural significance but are not dominant in the societies where they live. Across generations, contact with such languages may decline, affecting relationships among language, cultural knowledge, family memory, and identity. Heritage language learning is therefore closely connected with social affiliation and participation in multilingual and cultural communities rather than grammatical proficiency alone (He, 2010; Valdés, 2001). This makes digital textbooks, electronic books, and audiobooks relevant to the social and cultural settings in which learners encounter them.

A recent initiative in Seoul provides a useful case. In 2025, the Seoul Metropolitan Office of Education introduced the International Educational Exchange Activation Project and provided approximately 140,000 Korean digital reading resources, including electronic books and audiobooks, through twenty six overseas Korean Education Centers. Developed amid growing overseas demand for Korean language and cultural education, the initiative expanded access to Korean language materials through the Seoul Digital Library platform (Choi, 2025; Oh, 2025). Rather than relying primarily on physical distribution, the project connects municipal digital infrastructure with overseas educational institutions and enables Korean language resources to circulate across national borders.

The scale of the initiative is notable, but the number of resources alone does not explain their educational significance. Access to an electronic book or audiobook does not show how learners engage with language, develop relationships with cultural content, or continue using resources over time. The institutional setting through which materials are introduced and accessed may be equally important. This study therefore examines how digital reading resources may operate as mediating cultural tools within transnational educational settings.

Vygotsky's sociocultural theory provides the main theoretical lens. Learning is understood as situated within social and historical contexts, with cultural tools playing an important role in human development (Vygotsky, 1978). Language, signs, books, and other symbolic resources shape how people participate in learning and interpret their environments. Later sociocultural scholarship further emphasizes relationships among tools, institutions, social interaction, and cultural context (Lantolf & Thorne, 2006; Wertsch, 1991). This perspective allows digital textbooks, electronic books, and audiobooks to be examined as resources whose educational meanings emerge through the settings and relationships in which they are used.

The case also raises questions of governance. International cultural and educational exchange is often examined through national governments or large institutions, yet the Seoul initiative involves a municipal education authority using locally developed digital infrastructure within an international educational network. The Seoul Metropolitan Office of Education remains a local public authority, while its electronic resources are made available through overseas Korean Education Centers. The project therefore provides an opportunity to examine how subnational educational actors participate in transnational exchange and how public resources developed for local use acquire wider international functions.

This study examines the 2025 initiative as a qualitative case of municipal digital education and institutional circulation. The analysis follows the relationship among Seoul as the source of policy and content, the digital platform, overseas Korean Education Centers, and learners in local educational environments. It considers both the structural conditions enabling circulation and the symbolic meanings associated with language, cultural memory, identity, and linguistic engagement.

Heritage language research has emphasized the relationship between language, cultural identity, and social affiliation, while educational technology research has highlighted access and digital infrastructure. The Seoul case adds a governance dimension by examining how a municipal authority connects public digital resources with overseas educational institutions. This intersection of language, technology, and governance provides a basis for examining digital education as institutional and cultural mediation and for considering its relevance to SDG 4.

Methodology

This study uses a qualitative case study design to examine the Seoul Metropolitan Office of Education's International Educational Exchange Activation Project as a municipal form of digital and transnational educational exchange. The analysis focuses on the institutional relationships through which digital resources are organized and circulated among municipal policy, digital infrastructure, overseas Korean Education Centers, and intended learners. The case is treated as a bounded policy and institutional setting operating across national borders (Yin, 2018).

The case boundary centers on the 2025 initiative led by the Seoul Metropolitan Office of Education. Seoul provides the policy direction and access to digital content, while the institutional boundary extends to the digital library and platform infrastructure, participating overseas Korean Education Centers, and the diaspora and international learners identified in relevant documents. These connections show how a locally developed public education resource acquires a transnational function.

The document corpus focuses on materials surrounding the 2025 initiative, with selected 2024 documents included to establish its institutional foundations. These materials address international education networks, cooperation with overseas Korean Education Centers, digital library services, Korean language education, and international educational exchange. The empirical material consists primarily of policy plans, press releases, program descriptions, public reports, digital library information, and institutional materials issued by the Seoul Metropolitan Office of Education and affiliated services. Documents concerning cooperation with overseas Korean Education Centers were included when they provided evidence of digital educational exchange, institutional networking, or resource circulation. These documents were treated as institutional records revealing policy purposes, organizational priorities, and meanings assigned to the initiative (Bowen, 2009).

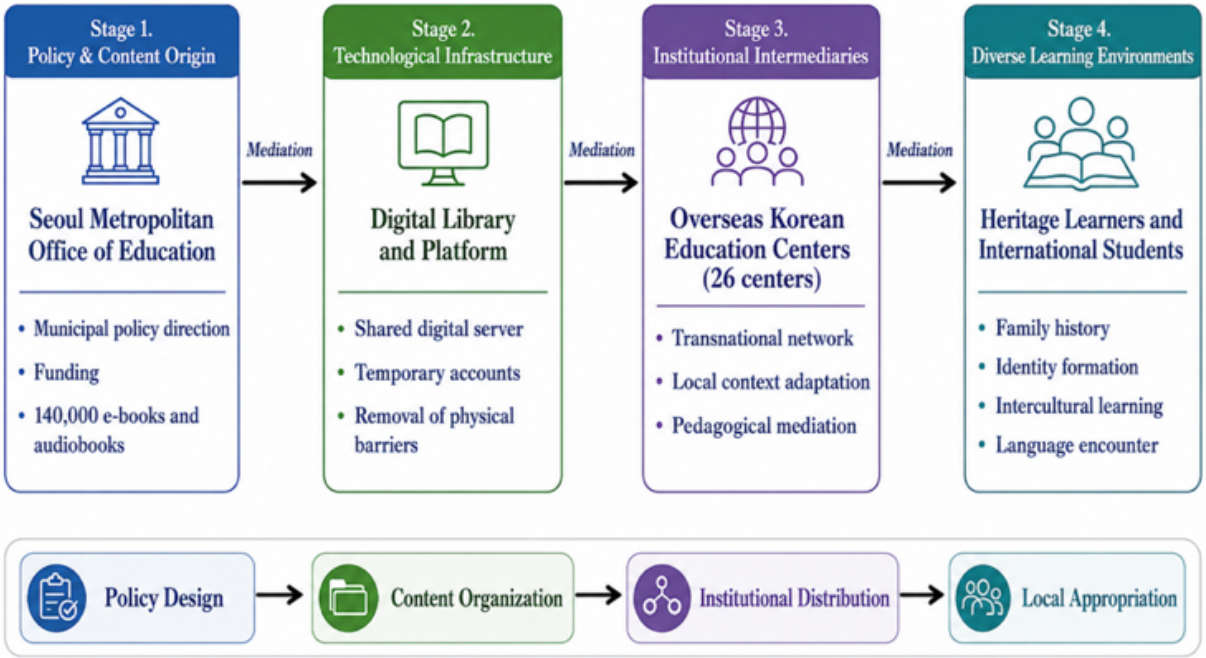
Table 1

Document Corpus and Analytical Role in the Study

Source	Year	Document Type	Institutional Context	Analytical Use
Seoul Metropolitan Office of Education	2024	Policy plan	International education and digital policy	Policy trajectory and municipal governance
Seoul Metropolitan Office of Education	2024	Official press release	Cooperation with Korean Education Center in France	Local adaptation and institutional networking
Seoul Metropolitan Office of Education related reporting	2025	Program announcement	Digital resource provision to overseas centers	Scale and circulation pathway
Oh	2025	News report	Electronic library access and distribution structure	Platform access and implementation
Seo	2025	News report	Public representation of the initiative	Language and cultural framing
Choi	2025	News report	Overseas access to Korean digital resources	Public visibility and transnational reach

The 2024 Seoul education policy plan was examined to identify the policy environment in which the initiative developed, particularly references to international education infrastructure, overseas Korean Education Centers, global competence, digital library services, and online educational resources. Materials concerning cooperation with the Korean Education Center in France were also included because they demonstrate how Seoul connected Korean language education, digital technology, institutional networking, and international exchange before the 2025 project (Seoul Metropolitan Office of Education, 2024a, 2024b).

Figure 1
Digital Mediation Pathway



Public reporting from established news organizations supplemented the official record by providing information on the reported scale of the initiative, participating overseas Korean Education Centers, the available electronic books and audiobooks, and the rationale for expanding access to Korean language resources abroad. Claims about the project's structure and scope were checked against official materials whenever possible. News reports were used primarily to reconstruct public presentation of the initiative rather than to establish learner outcomes (Choi, 2025; Oh, 2025).

Documents were selected purposively according to their relevance to the research questions. Materials were retained when they addressed the initiative directly or documented its institutional setting, including international Korean language education, cooperation with overseas Korean Education Centers, digital library services, municipal international education policy, platform-based distribution, and public educational exchange. Documents were also included when they identified participating actors, policy objectives, resource circulation, intended learners, or the cultural and educational significance assigned to the initiative. Repetitive materials without substantive information were removed, as were unattributed sources, personal social media content, commercial materials, and unsupported commentary.

The unit of analysis was a meaningful passage addressing one or more elements of the research problem, including policy purpose, institutional responsibility, technological mediation, resource circulation, intended users, educational access, cultural meaning, and expected outcomes. Passages were interpreted within their institutional context rather than separated from the purpose and audience of the original document.

The analysis combined qualitative document analysis with thematic coding. Documents were read repeatedly, with initial codes recorded alongside information on source, institution, publication date, intended audience, and relationship to the initiative. Codes were revised as patterns emerged, with related codes combined and analytically distinct ones separated. Coding moved iteratively between the documents and emerging themes, drawing on the thematic

analysis approach described by Braun and Clarke and the coding practices outlined by Saldaña (Braun & Clarke, 2006; Saldaña, 2021).

The analysis combined qualitative document analysis with thematic coding. The documents were read Vygotsky's sociocultural theory informed the analysis from the beginning. Coding focused on cultural tools, mediation, social and historical context, institutional support, and scaffolding. A passage was coded as mediation when it described how a resource, platform, institution, or educational practice connected learners with language or cultural content. Digital materials were treated as cultural tools when institutional texts positioned them as resources through which learners could encounter language, stories, voices, cultural knowledge, or educational practices. References to organizational access, guidance, continuity, and structured distribution were examined as forms of institutional scaffolding (Vygotsky, 1978; Wertsch, 1991).

The analysis remained grounded in institutional evidence. Electronic books and audiobooks were not assumed to produce learning simply because they were digitally available. Instead, attention focused on how materials entered the platform, how overseas education centers were positioned within distribution, how learners were represented, and what educational meanings were attached to the resources. This reading is consistent with the sociocultural view that tools acquire significance through mediated activity within particular social and institutional settings (Lantolf & Thorne, 2006; Wertsch, 1991).

Two broad analytical patterns emerged. The first concerned the structural conditions enabling circulation, including municipal policy design, digital infrastructure, institutional distribution, coordination across sites, access, international networking, and educational equity. These codes traced how materials moved through technological and institutional channels and the roles assigned to Seoul, the digital platform, overseas Korean Education Centers, and local educational settings.

The second concerned symbolic meanings attached to the resources, including heritage framing, cultural memory, language identity, belonging, shared narratives, linguistic engagement, voice, listening, and cultural connection. These themes emerged from passages connecting the materials with cultural continuity, identity, international understanding, and relationships between overseas learners and Korea.

Theoretical and open coding were used together. Vygotsky's concepts provided an initial interpretive lens, while additional codes were introduced when documents revealed institutional relationships or policy dynamics not fully captured by the framework. Emerging codes were compared across sources and retained when they explained recurring patterns or significant features of the case.

The structural and symbolic dimensions were then examined together. Structural analysis traced how access was organized through policy, technology, and institutions, while symbolic analysis examined how resources were connected to heritage, cultural memory, identity, and linguistic engagement. This combined approach informed the digital mediation pathway, which traces movement from Seoul as the source of policy direction and content, through the digital platform and overseas Korean Education Centers, to learners in diaspora and international settings.

The three research questions organized the coded material. Evidence concerning movement, distribution, access, and institutional connections informed the analysis of circulation. Infrastructure, coordination, heritage framing, memory, identity, and linguistic engagement informed the analysis of structural and symbolic dynamics. Materials concerning municipal authority and international educational exchange informed the analysis of how the case relates to nation-centered models of cultural diplomacy.

Credibility was strengthened through comparison across official policy documents, institutional descriptions, platform materials, and reputable public reporting. A source matrix recorded the basis of major interpretations and compared similar claims across documents. Coding definitions and analytic notes were revised throughout the process to maintain a traceable connection between documentary evidence and findings (Lincoln & Guba, 1985).

Claims about educational access, cultural engagement, and learner development were interpreted according to the available evidence. Distribution and institutional availability support findings about access and resource circulation, while references to identity, language development, belonging, and cultural engagement are treated as institutional meanings and educational possibilities where direct learner evidence is unavailable. All materials were publicly available, and no human participants or personally identifiable data were included.

Results and Findings

The 2025 initiative emerged from Seoul's earlier development of international education activities and digital public infrastructure. Municipal policy, the Seoul Metropolitan Office of Education electronic library, overseas Korean Education Centers, and learners abroad appear as connected elements of an institutional arrangement through which a local public education infrastructure was extended into an international network.

The policy background is visible in the Seoul Metropolitan Office of Education's 2024 agenda, which linked international educational exchange with preparation for a globally connected future and digital education. Cooperation with institutions abroad was already developing before the 2025 electronic library initiative, placing the later project within an established policy direction (Seoul Metropolitan Office of Education, 2024a).

The cooperation with the Korean Education Center in France illustrates this development. In April 2024, the Seoul Metropolitan Office of Education and the center organized training for fourteen teachers working in French schools where Korean was taught. The program responded to local needs in Korean language pedagogy and educational information technology and included Korean language and cultural education, digital activities, teacher networking, and institutional visits (Seoul Metropolitan Office of Education, 2024b). The digital component was adapted to the French technological environment (Seoul Metropolitan Office of Education, 2024b). This earlier collaboration shows that the relationship between Seoul and overseas Korean Education Centers already connected Korean language education with local educational needs, teacher networks, cultural content, and technology.

In 2025, approximately 140,000 Korean language electronic books and audiobooks were made available through twenty-six overseas Korean Education Centers, including around 9,000 items intended for children and young people. Contemporary reporting described the initiative as the first program in which a metropolitan or provincial education office in South Korea supported

overseas Korean Education Centers with access to an electronic book service (Oh, 2025; Seo, 2025).

The project addressed difficulties associated with distributing printed books across countries under limited budgets and growing demand. Instead, participating centers were connected to a subscription-based electronic library service already operated by Seoul. Users could receive temporary service accounts without completing the ordinary individual membership process, while the reported service provided access without usual limits on concurrent users or borrowed items (Oh, 2025).

The institutional innovation lay in extending an existing public system. Infrastructure developed within the municipal education system acquired an additional function when overseas Korean Education Centers entered its distribution network. The shift from printed materials to shared digital access altered both the scale of distribution and the organizational requirements for maintaining it.

The circulation runs from municipal policy and content in Seoul through the electronic platform and overseas Korean Education Centers to local learning environments. Seoul provides policy direction and access to the collection, the digital library extends its geographical reach, and overseas centers connect the service with learners in different linguistic, institutional, and educational contexts.

A shared platform creates continuity across dispersed sites. Participating centers can draw from the same collection without maintaining equivalent physical libraries, while temporary accounts reduce administrative barriers to access (Oh, 2025). At the same time, the 2024 France program demonstrates that shared infrastructure does not eliminate local differences. The training content responded to needs expressed in France, and digital activities were adapted to its technological environment (Seoul Metropolitan Office of Education, 2024b). The project therefore combines common resources with local adaptation.

The distribution model also changes the geographical reach of municipal educational infrastructure. Seoul is a subnational public authority whose primary responsibilities concern education within the city, yet its publicly maintained resources are now used through institutions outside South Korea. This international function emerged through cooperation with overseas Korean Education Centers and policy relationships established before 2025 (Seoul Metropolitan Office of Education, 2024a, 2024b).

This pattern reflects research on the international activities of cities and subnational governments through policy networks, institutional partnerships, and cultural and educational initiatives (Acuto, 2013; Tavares, 2016). The Seoul case illustrates how transnational educational activity can emerge through interaction among multiple levels of public institutions rather than through national actors alone.

The resources also carry symbolic significance. The initiative responded to overseas demand for Korean language learning and was intended for overseas Koreans and other students abroad. Electronic books and audiobooks are presented as resources for Korean language education and cultural access rather than simply as a large digital catalogue (Seo, 2025).

Heritage language scholarship helps explain why this context matters. Heritage language learning involves social affiliation and cultural experience as well as linguistic competence (He,

2010). Although the Seoul documents do not classify the entire collection as heritage material, its circulation through institutions serving overseas Korean communities creates conditions in which some resources may acquire a heritage-related role. Their meaning is shaped partly by the institutional settings and learners for whom they are made available.

Vygotsky's concept of mediation offers a way to understand this relationship. Cultural tools participate in learning through the social activities and meanings surrounding their use (Vygotsky, 1978). The electronic books and audiobooks pass through a public platform and educational institutions before reaching learners, distinguishing them from digital files circulating without an identifiable educational context.

Overseas Korean Education Centers are central to this process. They connect the digital collection with locally situated educational communities and provide an institutional context through which resources can enter language learning and cultural participation (Wertsch, 1991).

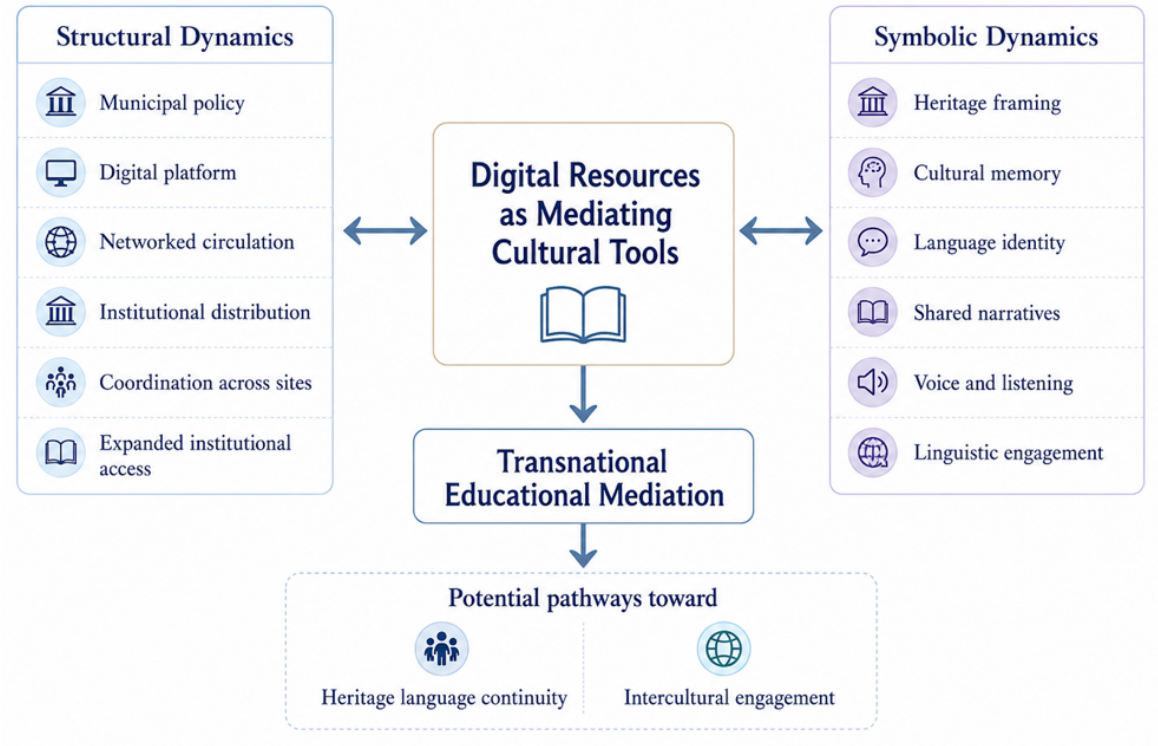
Audiobooks add another form of linguistic contact. Written resources provide vocabulary, narrative, and textual forms, while audio exposes learners to pronunciation, rhythm, voice, and intonation. For learners with limited opportunities to hear Korean in everyday environments, this expands the ways in which the language can be encountered.

The shared collection creates a common pool of Korean language content across geographically distant learning sites, although learners may select and interpret materials differently. Heritage language research connects language practices with cultural understanding and identity, while research on Korean heritage speakers similarly identifies relationships among language proficiency, cultural experience, and engagement with heritage communities (He, 2010; Park, 2024).

For diaspora and heritage learners, resources may connect with language, family history, or community life. International learners may encounter the same infrastructure as a point of contact with Korean language and culture. These forms of engagement differ, but both fall within the intended reach of the initiative, which explicitly refers to overseas Koreans and students abroad (Seo, 2025).

The documents bring structural and symbolic processes into the same institutional space. The platform provides access, while educational contexts shape its meaning. Korean language and cultural content carries symbolic value, but requires institutional channels through which geographically dispersed learners can encounter it. In this case, municipal policy, digital infrastructure, overseas education institutions, and local learning environments form the conditions of mediation.

Figure 2
Interaction Between Structural and Symbolic Dynamics in Digital Mediation



The digital mediation pathway begins with policy decisions and content in Seoul, moves through the electronic platform and overseas Korean Education Centers, and reaches learners within particular linguistic and cultural circumstances. The circulation of a digital resource thus involves institutional decisions at multiple points before it becomes part of a local learning environment.

The case also suggests a broader understanding of digital legacy. Cultural and linguistic memory is not transferred unchanged from Seoul to overseas learners. Materials move through institutions and are encountered in new social settings, where their meanings may be shaped by the platform, educational context, and learner's relationship with the language. Digital legacy here refers to the mediated availability of cultural and linguistic resources for renewed use across locations.

These patterns clarify how resources travel from Seoul to learners abroad. Municipal policy and digital infrastructure make circulation possible, while overseas institutions organize where and through whom resources are accessed. Networked access provides structural conditions, while Korean language and cultural content enters settings already associated with language learning and cultural exchange. Digital resources can thus function as mediating cultural tools through institutional and social relationships.

The governance pattern extends the case beyond digital education. A resource maintained by a municipal education authority has entered an international network through partnerships with overseas educational institutions. National institutions remain part of the system, but the municipality contributes its own policy capacity and public infrastructure. The case adds an educational dimension to research on subnational international activity by showing how local public resources can acquire transnational functions through institutional cooperation (Acuto, 2013; Tavares, 2016).

Implications & Conclusion

The Seoul case draws attention to a dimension of digital education that is often overlooked when policy discussion focuses on the number of resources provided. The significance of the initiative lies in the institutional pathway created around those resources. A municipal electronic library developed within Seoul now reaches learners abroad through overseas Korean Education Centers. The case shows how digital resources can become part of educational settings through public infrastructure and institutional relationships operating across geographical distance.

This finding extends a sociocultural understanding of mediation beyond the relationship between learners and individual tools. Electronic books and audiobooks acquire educational significance through the contexts in which they circulate and are encountered. The pathway connecting the municipal authority, digital platform, overseas education centers, and local learning environments shapes how these resources can function as cultural tools (Vygotsky, 1978; Wertsch, 1991). The 140,000 electronic books and audiobooks are significant in scale, but the more distinctive feature of the initiative is the public network that makes them available across multiple overseas settings.

For educational technology policy, the case suggests that content provision is only one part of digital inclusion. A large digital collection can expand available resources, yet meaningful use depends on institutional support, local educational practice, and learners' ability to engage with the materials. Digital access may reduce barriers created by physical distance and the distribution of printed resources, while inequalities in devices, connectivity, institutional support, and learning opportunities may persist (UNESCO, 2023). The Seoul initiative illustrates how an existing public digital service can be extended internationally while retaining the institutional relationships necessary for its use.

The initiative also has implications for heritage language education. Heritage language learning is often connected with family history, cultural affiliation, and geographically dispersed communities (He, 2010; Valdés, 2001). Access to Korean-language reading and audio materials can provide additional opportunities for contact with the language among learners living outside Korea. The inclusion of both electronic books and audiobooks broadens the forms of linguistic engagement, combining sustained contact with written language with exposure to pronunciation, rhythm, and voice. The overseas education centers are important because they place these resources within institutions already involved in Korean language education and cultural exchange.

The same infrastructure can serve learners with different relationships to Korean language and culture. Heritage learners may approach the collection through family or community connections, whereas international learners may encounter Korean as a new linguistic and cultural environment. The initiative does not need to reduce these experiences to a single category of learner. By providing a shared institutional network, it creates opportunities for different forms of engagement with language and culture. Such access does not automatically produce intercultural understanding, but it can provide materials through which learners encounter perspectives beyond their immediate environments and potentially develop forms of global competence (OECD, 2018).

The initiative also relates to Sustainable Development Goal 4 through its expansion of educational opportunity. SDG 4 emphasizes inclusive and equitable quality education as well

as global citizenship and appreciation of cultural diversity (United Nations, 2015). Extending a public digital collection beyond Seoul demonstrates how locally developed educational infrastructure can serve learners outside its original territorial setting. The implications for equity, however, depend on the conditions under which learners and institutions can actually participate.

This point has practical implications for future implementation. A shared digital platform can provide continuity across overseas centers and reduce the need to reproduce physical collections at each location. Local institutions, however, remain responsible for responding to differences in learners' linguistic backgrounds and educational needs. Seoul's earlier cooperation with the Korean Education Center in France suggests the value of combining shared resources with adaptation to local educational and technological conditions. Replication by other municipalities would similarly depend on existing infrastructure, institutional capacity, and international partnerships rather than simply reproducing the same digital library model.

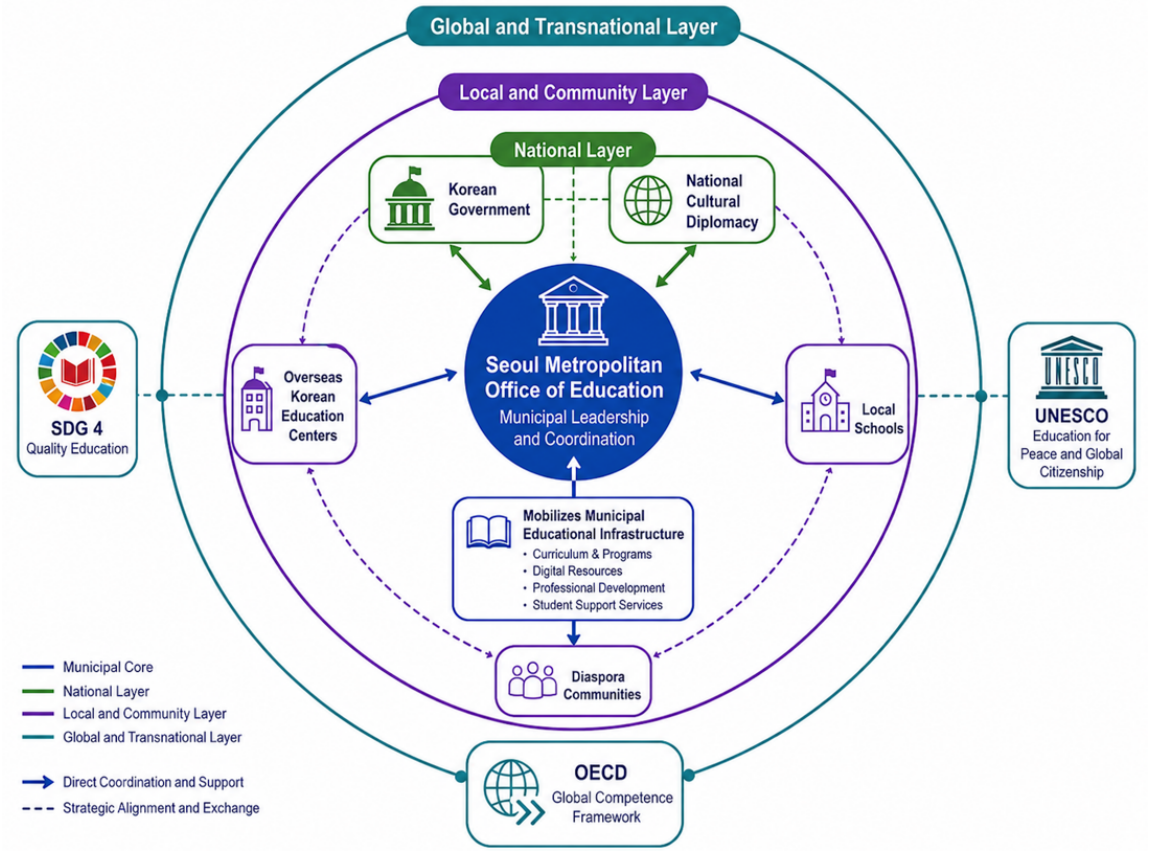
The case also contributes to discussions of cities and subnational actors in international exchange. The Seoul Metropolitan Office of Education has not replaced national institutions; overseas Korean Education Centers remain central to the distribution pathway. Rather, the case demonstrates how a municipal education authority can use its own public infrastructure within an international institutional network. A service originally developed for local education can thus acquire a transnational function through cooperation across institutional levels, reflecting broader patterns of subnational participation in international networks (Acuto, 2013; Tavares, 2016).

This has implications for how cultural diplomacy is understood. Educational exchange can create cultural relationships through access to language, reading, and sustained engagement with cultural materials, even when the initiative originates in a municipal education system rather than a national diplomatic program. The Seoul case shows how local educational policy can contribute to transnational cultural exchange without functioning as a substitute for national diplomacy.

The concept of digital legacy developed in this study follows from this movement across institutions and locations. Digital legacy is not simply cultural material stored online. In this case, Korean-language resources remain available for renewed use because public infrastructure allows them to circulate into new educational environments. Their meanings may change as they are encountered by heritage learners, international students, teachers, and institutions in different contexts. Cultural transmission through digital infrastructure is therefore a process of circulation and reinterpretation shaped by both technology and institutional relationships.

The structural and symbolic dimensions of the case are closely connected. The digital platform and institutional network make circulation possible, while the linguistic and cultural content gives that circulation educational significance. A culturally meaningful collection has limited reach without a system of access, while an efficient platform has limited educational value if its resources remain disconnected from the settings in which learners use them. The Seoul initiative demonstrates how these dimensions can operate together within a transnational public education network.

Figure 3
Layered Governance Network in Seoul's Transnational Educational Initiative



Evaluation of similar initiatives should consequently extend beyond the number of titles, accounts, or participating centers. These measures demonstrate reach but reveal little about what happens after access is created. Future research should examine how resources are incorporated into teaching and how learners engage with them over time. Direct research with learners and educators could assess whether continued access contributes to sustained language use, cultural engagement, identity formation, or intercultural learning. The documentary nature of the present study limits its conclusions to policy structures, institutional arrangements, and the educational possibilities represented in public materials.

The contribution of the Seoul case lies in bringing digital education, heritage language learning, and municipal governance into the same empirical setting. Digital education appears here as a question of public infrastructure and circulation; heritage language education highlights language and cultural connection; and municipal governance explains how a local public authority can participate in international educational networks. Together, these dimensions reveal a form of transnational public education in which resources developed at the city level move through institutional cooperation across borders.

The distinctive feature of the initiative is not electronic books or audiobooks themselves. Its distinctive feature is the connection between an existing municipal resource and overseas educational institutions as part of a continuing public initiative. Technology enables the movement of resources, while the institutional arrangement gives that movement continuity and educational direction. The Seoul Metropolitan Office of Education case demonstrates how public digital infrastructure can acquire a function beyond the territory in which it was created,

providing heritage and international learners with new opportunities to encounter Korean language and cultural materials.

The case offers a concrete model for understanding digital education as a form of transnational public exchange. It also shows how municipal education policy can participate in international educational collaboration through the circulation of publicly developed resources. Digital infrastructure can carry cultural and linguistic legacies across borders, but its educational significance depends on the institutions and learning environments through which those resources are encountered.

References

Acuto, M. (2013). The new climate leaders? *Review of International Studies, 39*(4), 835–857. https://doi.org/10.1017/S0260210512000502

Asian Development Bank. (2003). *Toward e-development in Asia and the Pacific: A strategic approach for information and communication technology*. https://www.adb.org/documents/toward-e-development-asia-and-pacific-strategic-approach-information-and-communication

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27–40. https://doi.org/10.3316/QRJ0902027

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Choi, J.-Y. (2025, March 24). *Seoul expands Korean e-book access to overseas learners*. The Korea Herald. https://www.koreaherald.com/article/10448695

He, A. W. (2010). The heart of heritage: Sociocultural dimensions of heritage language learning. *Annual Review of Applied Linguistics, 30*, 66–82. https://doi.org/10.1017/S0267190510000073

Lantolf, J. P., & Thorne, S. L. (2006). *Sociocultural theory and the genesis of second language development*. Oxford University Press.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.

OECD. (2018). *Preparing our youth for an inclusive and sustainable world: The OECD PISA global competence framework*. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/global-competence/Handbook-PISA-2018-Global-Competence.pdf

Oh, J. (2025, March 24). *140,000 Korean language e-books available for rent overseas in the US, Japan, France, and more*. Asia Business Daily. https://www.asiae.co.kr/en/article/2025032321560471557

Park, M. Y. (2024). Heritage language use and identity construction: A study of two Korean-American bilingual adolescents. *Sustainable Multilingualism, 24*(1), 1–22. https://doi.org/10.2478/sm-2024-0001

Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). Sage.

Seo, H.-R. (2025, March 24). *Seoul education office provides Korean e-books to Korean Education Centers in 26 countries, including the United States and Japan*. Yonhap News Agency. https://www.yna.co.kr/view/AKR20250321125200530

Seoul Metropolitan Office of Education. (2024a). *2024 Seoul education major policy tasks*. https://www.sen.go.kr/user/bbs/BD_selectBbs.do?q_bbsDocNo=20240105133450334&q_bbsSn=1025

Seoul Metropolitan Office of Education. (2024b, April 11). *Seoul Metropolitan Office of Education promotes educational exchange with France through Korean language education*. https://enews.sen.go.kr/media/media_view.do?bbsSn=186109&step1=3&step2=1

Tavares, R. (2016). *Paradiplomacy: Cities and states as global players*. Oxford University Press.

UNESCO. (2000). *The Dakar framework for action: Education for all: Meeting our collective commitments*. https://unesdoc.unesco.org/ark:/48223/pf0000121147

UNESCO. (2023). *Global education monitoring report 2023: Technology in education: A tool on whose terms?* https://www.unesco.org/gem-report/en/technology

UNESCO Institute for Statistics. (2009). *Guide to measuring information and communication technologies (ICT) in education*. https://unesdoc.unesco.org/ark:/48223/pf0000186547

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. https://sdgs.un.org/publications/transforming-our-world-2030-agenda-sustainable-development-17981

Valdés, G. (2001). Heritage language students: Profiles and possibilities. In J. K. Peyton, D. A. Ranard, & S. McGinnis (Eds.), *Heritage languages in America: Preserving a national resource* (pp. 37–80). Center for Applied Linguistics & Delta Systems.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wertsch, J. V. (1991*). Voices of the mind: A sociocultural approach to mediated action*. Harvard University Press.

World Bank Group. (2003). *ICT and MDGs: A World Bank Group perspective*. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/538451468762925037/ict-and-mdgs-a-world-bank-group-perspective

World Economic Forum. (2024, January 16). *Accelerating digital inclusion for 1 billion people by 2025*. https://www.weforum.org/stories/technological-innovation/digital-inclusion/

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.

Career-Ready in Tech: Empowering Low-Income and Underrepresented Students Through the REP Scholarship Program

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Abstract

This case study highlights the impact of the National Science Foundation–funded Rebooting through EmTech Program (REP) at Miami Dade College between 2023 and 2025. REP provides financial support, mentorship, and professional development to students pursuing degrees in cybersecurity, data analytics, and information systems technology. Many REP Scholars are from historically underrepresented backgrounds in STEM, and the program has been instrumental in helping them persist through academic, financial, and personal challenges. Evaluation methods included student surveys, faculty mentor focus groups, post-graduation surveys, and institutional data on GPA, persistence, and course pass rates. Results show that REP strengthens student achievement and confidence. Scholars reported greater self-efficacy, stronger persistence, and increased readiness to pursue technology careers. One student noted that mentors "made me feel like I truly belong in tech," reflecting the program's impact on both skill and identity. Faculty mentorship emerged as a central strength, offering technical guidance alongside career navigation, encouragement, and psychosocial support. The findings also revealed areas for student growth, with some students reporting difficulty balancing academics with work or family obligations, others described a weaker sense of campus belonging, and a few experienced less engaging mentorship experiences. Program recommendations included structured mentor training, expanded undergraduate research, and clearer communication about campus resources. The most significant outcome is that REP has helped students stay in school, build confidence, and see themselves as future leaders in technology. Building on these results, this case study will highlight successes, share lessons learned, and explore strategies to strengthen equity, mentorship, and career readiness in STEM education.

Keywords: career readiness, community college, computing education, mixed methods research, self-efficacy, student persistence, underrepresented students

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Introduction

The rapid growth of cybersecurity, data analytics, and information systems careers has intensified the demand for a diverse and highly skilled technology workforce. Labor market projections continue to show sustained expansion in computing occupations, particularly in cybersecurity and data science roles (U.S. Bureau of Labor Statistics [BLS], 2023). Even with such demands, participation and completion rates in computing disciplines remain uneven across socioeconomic and racial/ethnic groups. Students from low-income and historically underrepresented backgrounds in STEM face persistent structural barriers, including financial instability, competing employment demands, limited access to professional networks, and reduced social capital (Carnevale et al., 2020; National Academies of Sciences, Engineering, and Medicine [NASEM], 2016).

Financial strain is among the most significant predictors of attrition in STEM pathways (Chen, 2013; Goldrick-Rab et al., 2016). However, recent scholarship suggests that financial aid alone may be insufficient to address the layered academic and psychosocial challenges experienced by underrepresented students (Castleman & Long, 2016; Nguyen et al., 2019). Interventions that integrate financial support with structured mentorship and career-focused professional development may better support persistence and career readiness by simultaneously addressing economic, psychosocial, and professional barriers (Crisp et al., 2017; Estrada et al., 2016).

The Rebooting through EmTech Program (REP), funded in part by the National Science Foundation, was developed at Miami Dade College as a comprehensive intervention model. Between Fall 2023 and Spring 2025, REP provided scholarships, faculty mentorship, and structured professional development workshops to 74 scholars pursuing bachelor's degrees in cybersecurity, data analytics, and information systems technology. The program sought to reduce financial strain, strengthen academic confidence, foster belonging within computing, and increase readiness for workforce entry. To this end, REP was designed as an integrated support model combining three core components: financial scholarships to reduce employment burdens, faculty mentorship to support academic and professional development, and career-focused workshops addressing technical interviewing, resume preparation, networking, and certification pathways. Together, these components were intended to create a structured ecosystem supporting student persistence and career readiness in emerging technology fields.

To evaluate the effectiveness of this integrated intervention, the present study examines REP's influence on academic persistence, psychosocial development, and career readiness among participating scholars through three research questions:

- **RQ1:** To what extent does participation in REP influence academic persistence and performance?
- **RQ2:** How does REP participation affect scholars' self-efficacy, confidence, and sense of belonging in emerging technology fields?
- **RQ3**: In what ways does REP contribute to career readiness and early workforce outcomes?

This paper makes three contributions to research on computing education and STEM student success. First, it provides empirical evidence that integrated scholarship programs combining financial support, mentorship, and professional development can improve persistence and academic engagement among low-income and underrepresented computing students. Second, it demonstrates how cohort-based mentoring structures support self-efficacy and belonging within technology programs, reinforcing theoretical predictions from Social Cognitive Career

Theory and student integration research. Third, it shows how structured professional development activities—including workshops and certification pathways—translate academic preparation into measurable career readiness outcomes. These findings highlight the potential of integrated support ecosystems to strengthen equity and workforce preparation in emerging technology education, positioning REP as a model for understanding how integrated supports can improve persistence and career readiness in computing education.

Related Work

Self-Efficacy and STEM Persistence

Self-efficacy theory posits that individuals' beliefs in their capability to perform tasks influence motivation, resilience, and academic persistence and performance (RQ1) (Bandura, 1997). In computing education, technical self-efficacy has been repeatedly associated with continuation in the major and academic achievement (Lewis et al., 2021; Ramalingam et al., 2004). Students from historically underrepresented groups in STEM frequently report lower levels of academic confidence, often shaped by stereotype threat, limited representation in technical fields, and structural barriers within educational environments (NASEM, 2016; Ong et al., 2018).

Prior research suggests that interventions that strengthen technical competence and reinforce professional identity can significantly improve persistence in computing disciplines. Mentorship, exposure to role models, and structured opportunities to practice technical skills have been shown to reinforce students' belief in their ability to succeed in STEM fields (Estrada et al., 2016). These mechanisms highlight the importance of environments that actively cultivate confidence and professional identity (RQ2) development among computing students.

Belonging and Identity in Computing

Building on self-efficacy, belonging and social integration represent a second critical mechanism influencing students' confidence, sense of belonging, and persistence. Belongingness theory suggests that feeling accepted and valued within an academic community is a key predictor of persistence and academic success (Walton & Cohen, 2011). In computing education, students' sense of belonging has been strongly linked to continuation in the major, particularly among students from minoritized backgrounds (Barker et al., 2009; Lewis et al., 2021).

Structured mentorship programs and cohort-based learning communities have been shown to strengthen students' connection to academic programs and reduce feelings of isolation often experienced in computing fields (Crisp et al., 2017). Such environments can foster a sense of shared identity and collective support, which may be particularly important for students navigating disciplines where they are historically underrepresented.

Research further suggests that mentorship relationships can function as mechanisms of social integration, helping students develop both academic networks and confidence in their role within the computing community (RQ2).

Career Readiness and Human Capital

Career readiness frameworks emphasize experiential learning, certification attainment, professional networking, and skill demonstration as mechanisms for workforce alignment and

early career outcomes (RQ3) (National Association of Colleges and Employers [NACE], 2023). Certifications and industry exposure are particularly salient in cybersecurity and information technology fields, where employers often evaluate candidates based on demonstrable competencies in addition to formal degrees (Carnevale et al., 2020).

Within computing education, career preparation initiatives that integrate industry certifications, internship preparation, and professional networking opportunities have been shown to strengthen students' transition from academic programs into technology careers and workforce entry (RQ3). These experiences allow students to accumulate forms of human capital that signal technical competence to employers while also helping students better understand professional expectations within the technology workforce.

Despite growing research on mentorship, financial support, and career preparation individually, fewer studies have examined integrated intervention models that combine these elements within a single program structure. The present study addresses this gap by evaluating the impact of the Rebooting through EmTech Program (REP), which integrates financial support, faculty mentorship, and structured professional development within a unified intervention model.

Conceptual Framework

This study is guided by three complementary theoretical perspectives: Social Cognitive Career Theory (SCCT), Tinto's Student Integration Model, and research on student financial well-being. Together, these frameworks provide a comprehensive lens for understanding how scholarship programs integrating financial support, mentorship, and professional development may influence students' persistence and career readiness in computing fields.

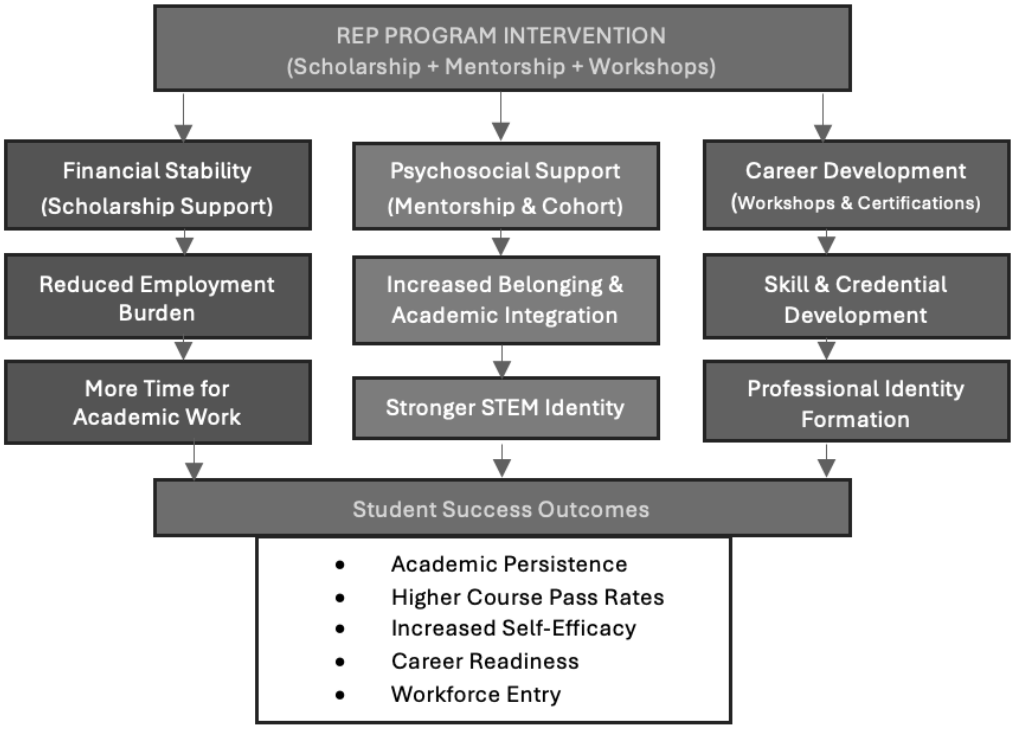
Social Cognitive Career Theory (SCCT) explains how career development is shaped by the interaction between self-efficacy beliefs, outcome expectations, and environmental supports (Lent et al., 1994). Within the context of STEM education, SCCT suggests that mentorship, skill-building opportunities, and exposure to professional pathways can strengthen students' confidence in their abilities and increase their likelihood of persisting in technical fields. In the REP program, professional development workshops and faculty mentorship serve as environmental supports enhancing students' career self-efficacy and readiness for technology careers.

Tinto's Student Integration Model emphasizes the importance of academic and social integration in promoting student persistence in higher education (Tinto, 1994). Students who feel connected to their academic community and supported by faculty and peers are more likely to remain enrolled and complete their degrees. REP's cohort-based structure and mentorship activities are designed to foster such integration by building relationships among scholars and faculty mentors while strengthening students' sense of belonging within computing programs.

Finally, research on student financial well-being highlights how financial insecurity can negatively affect academic engagement and persistence (Goldrick-Rab et al., 2016). Scholarship programs can alleviate the financial pressures often requiring students to work long hours while enrolled. By reducing employment time burdens, financial support allows students to devote greater time and cognitive resources to academic work and professional preparation.

Together, these frameworks inform the conceptual model guiding this study. The model proposes that REP influences student outcomes through three interconnected pathways: financial stability, psychosocial development through mentorship and belonging, and career competency development through professional preparation activities. As illustrated in Figure 1, these pathways are expected to support both academic persistence and career readiness among students pursuing degrees in emerging technology fields.

Figure 1
Conceptual Model of the REP Integrated Support Framework



In the context of STEM retention, financial aid alone is a necessary but insufficient mechanism for long-term student success. Students from historically underrepresented backgrounds often navigate a "double bind" of financial pressure and psychosocial isolation that can undermine persistence even when academic ability is strong (Ong et al., 2018). REP is therefore conceptualized not as a stand-alone scholarship program but as an integrated support ecosystem designed to address financial stability, psychosocial development, and professional identity formation simultaneously.

This integrated framework draws upon three complementary theoretical pillars—SCCT, Tinto's Student Integration Model, and financial well-being research. Table 1 summarizes the central mechanisms of each framework and how they are operationalized within the REP program.

Table 1
Theoretical Foundations Informing the REP Conceptual Framework

Theory Name	Core Mechanism	Application in REP
Social Cognitive Career Theory (SCCT)	Focuses on self-efficacy beliefs and environmental supports to shape career development.	Faculty mentorship and professional workshops serve as environmental supports to build technical confidence.
Tinto's Student Integration Model	Emphasizes that academic and social integration are primary predictors of student retention.	Cohort-based programming and mentor-led engagement foster a sense of belonging within the computing community.
Financial Well-being Research	Analyzes how reducing economic strain frees cognitive bandwidth for academic focus.	Stipends facilitate debt reduction and allow scholars to "keep bills afloat," reducing the need for non-tech employment.

By addressing the material realities of student life alongside academic and professional preparation, REP functions as a structured ecosystem for systemic equity rather than a simple financial transfer. Conceptually, the program proposes that financial support reduces economic barriers to persistence, mentorship strengthens students' sense of belonging and academic confidence, and professional development activities build career competencies that facilitate workforce entry. Guided by this integrated logic model, the study employs a mixed-methods design to examine whether these proposed pathways are reflected in scholars' academic, psychosocial, and career outcomes.

Methodology

To capture a holistic understanding of the REP scholar experience, this study employed a mixed-methods evaluation design integrating quantitative institutional data with qualitative student and mentor perspectives. This triangulated approach allows the study to measure program outcomes while also capturing the lived experiences underlying student persistence and career development.

Participants

REP supported a total of 74 scholars between Fall 2023 and Spring 2025. Each semester's survey response counts were:

- Fall 2023 (N = 48)
- Spring 2024 (N = 62)
- Fall 2024 (N = 49)
- Spring 2025 (N = 39)

All surveys achieved 100% response rates.

An additional master's graduate survey included 41 respondents. Approximately half identified as Hispanic/Latino(a/x), and approximately one-fifth identified as Black/African American. The majority of the scholars were Pell-eligible.

Data Sources

Data sources included the following:

- Semester scholar surveys tracking financial stress, academic confidence, and belonging
- Graduate outcome surveys capturing employment and certification attainment
- Faculty mentor focus groups and surveys examining mentoring practices
- Institutional academic records including GPA, course pass rates, and persistence

Analytic Procedures

Paired-samples t-tests assessed changes in self-rated knowledge following workshops. Logistic regression examined semester-to-semester retention (binary outcome). Multiple regression modeled GPA as a function of demographic variables and program participation. Qualitative data were analyzed using inductive thematic analysis (Braun & Clarke, 2006).

Statistical significance was set at $p < .05$.

The mixed-methods design enabled triangulation between statistical trends and qualitative insights, strengthening interpretation of the mechanisms through which REP influences student persistence and career readiness. The following section presents findings aligned with the three research questions and interpreted through the integrated support framework described above.

Findings

This section presents findings organized by the study's three research questions: academic persistence and performance (RQ1), psychosocial development and belonging (RQ2), and career readiness outcomes (RQ3). Results draw from survey data, institutional records, workshop assessments, graduate surveys, and qualitative feedback from scholars and faculty mentors.

Academic Persistence (Retention) and Performance (RQ1)

RQ1: Retention

Logistic regression analysis indicated that REP participation significantly increased the likelihood of semester-to-semester retention compared to non-scholar peers enrolled in the same computing programs. The model controlled for race/ethnicity, gender, and residency status.

Across all survey semesters, 88–98% of scholars rated the scholarship as "very" or "extremely important" to their academic success, suggesting that financial support played a central role in enabling continued enrollment.

Scholars also reported consistently strong expectations of academic success. Across survey waves, 90% or more agreed or strongly agreed that they expected to succeed in upper-division EmTech coursework, indicating high levels of academic self-efficacy.

These findings align with prior research suggesting that comprehensive financial and academic support structures improve persistence in STEM pathways (Castleman & Long, 2016).

RQ1: Employment Burden

As seen in Table 2, one of the most notable program impacts was a substantial decline in full-time employment among scholars during the intervention period.

Table 2
Full-Time Employment Statistics

Semester	Percentage Employed Full-Time
Fall 2023	42%
Spring 2024	48%
Fall 2024	12%
Spring 2025	18%

The sharp reduction in full-time employment suggests that scholarship funding helped alleviate financial pressures that often require students to maintain demanding work schedules while enrolled in college. Focus group participants confirmed this interpretation, with several scholars reporting the scholarship enabled them to reduce work hours and devote more time to coursework and professional development activities.

Consistent with financial well-being research, the reduction in employment burden likely freed cognitive resources students could redirect toward academic performance (Goldrick-Rab et al., 2016).

Self-Efficacy, Confidence, and Belonging (RQ2)

RQ2: Self-Efficacy

Scholars reported consistently high confidence in their ability to succeed in EmTech coursework. Agreement with the statement *"I expect to do well in my EmTech courses"* remaining strong across semesters as shown in Table 3:

Table 3
Self-Efficacy Survey Results

Semester	Agreement
Fall 2023	96%
Spring 2024	92%
Fall 2024	84%
Spring 2025	90%

No statistically significant differences were observed across gender or degree programs.

These findings suggest that REP participation reinforced students' academic confidence, consistent with research linking mentorship and self-efficacy to STEM persistence (Estrada et al., 2016).

Confidence in Professional Competencies

Scholars also reported high levels of confidence across key professional competencies.

- 96–100% reported confidence in producing high-quality work
- 97.4% reported confidence working with people from diverse backgrounds

- 94.9% reported confidence adapting to changing circumstances

By Spring 2025, no scholar reported being "not at all confident" in any assessed competency, suggesting strong professional self-confidence among participants.

RQ2: Belonging

Faculty support ratings remained consistently high, with 92–100% of scholars reporting strong agreement that faculty were supportive of their success, with only a small proportion of students reporting weaker peer connections:

- 8% in Fall 2023
- 7% in Spring 2024

Qualitative findings revealed an important nuance: scholars reported strong belonging within the REP cohort but a weaker connection to the broader institutional environment. Because MDC is a commuter college without on-campus housing, opportunities for broader institutional integration may be comparatively limited. This distinction suggests that the program itself functions as an important community of support for students navigating computing programs.

This aligns with prior research indicating that structured mentoring communities can mitigate feelings of isolation experienced by underrepresented students in STEM fields (Ong et al., 2018).

Career Readiness and Workforce Outcomes (RQ3)

Career readiness in this study was conceptualized as a multidimensional construct encompassing skill development, credential attainment, professional engagement, and employment outcomes.

RQ3: Career Competency Gains

Professional development workshops produced statistically significant gains in self-reported knowledge across all topics, as shown in Table 4.

Table 4
Professional Development Analysis

Workshop Title	t-statistic	Effect Size (Cohen's d)
Resume Development	t(53) = 10.51	1.43
Technical Interviewing	t(31) = 7.98	1.41
Financial Literacy	t(50) = 8.11	1.14
Internship & Job Search	t(55) = 9.76	1.30
LinkedIn Optimization	t(53) = 8.90	1.22
CodePath Interview Prep	t(20) = 4.51	0.98

All effect sizes exceeded 0.80, indicating large practical impacts (Cohen, 1988). The magnitude of change suggests that workshops facilitated meaningful skill development in competencies directly related to hiring processes in computing industries, including resume preparation, interview performance, and networking strategies (NACE, 2023).

RQ3: Certification Attainment and Skill Capital

Among graduates surveyed (N = 41):

- 61% used scholarship funds for certification programs
- 37% participated in field-specific workshops
- 27% developed professional portfolios or resumes
- 20% attended networking events

Scholar certification, as part of the focus on job skills and attainment, was encouraged by professors and the program. The resulting impact in certification shows a substantial increase, from 13% prior to the program to 37% among program graduates.

One scholar explained: "For the NSF REP scholarship, I was able to complete certifications in cybersecurity that will help me secure a job."

These credentials function as observable signals of technical competence that are valued by employers in cybersecurity and IT fields (Carnevale et al., 2020).

RQ3: Employment Outcomes

Graduate survey data also provided insight into early workforce entry. Scholar employment roles included positions such as Cybersecurity Analyst and Data Analyst, indicating job attainment aligned with their computing-related career pathways.

Importantly, employment outcomes were not concentrated in temporary or unrelated positions. As seen in Table 5, the majority of employed graduates held permanent and full-time roles, suggesting stable workforce entry. Nearly all employed respondents reported that REP had adequately prepared them for technology careers, highlighting the program's role in bridging academic preparation and labor market expectations.

Table 5
Workforce Entry

Outcome	Percentage
Employed	56%
Permanent roles	83% of employed
Full-time (30+ hours)	78% of employed

Taken together, these findings suggest that REP influenced student success through multiple interactive mechanisms rather than through financial aid alone.

Discussion

In this study, the findings provided strong evidence that integrated support programs can significantly influence student persistence, psychosocial development, and career readiness in computing education. The results support the multidimensional conceptual framework guiding this research, demonstrating that financial stability, psychosocial support, and professional preparation interact to influence student success outcomes.

Financial Stability and Academic Persistence

Findings related to RQ1 suggest that REP's financial support played a critical role in improving academic persistence by reducing students' employment burden. The substantial decline in full-time employment—from 42–48% during the early program period to 12–18% during later semesters—indicates that scholarship funding enabled students to devote more time and cognitive energy to coursework.

These results align with research on student financial well-being, which suggests that financial stress functions as a "cognitive tax" that diverts attention away from academic tasks (Goldrick-Rab et al., 2016). By alleviating financial pressure, the REP scholarship allowed students to redirect their focus toward academic achievement and professional preparation. This shift likely contributed to observed improvements in course pass rates and retention.

From a theoretical perspective, these outcomes reinforce the financial stability pathway proposed in the conceptual framework. Financial support alone may not guarantee persistence; however, when paired with structured mentorship and professional development, it creates conditions in which students can fully engage in their academic programs.

Psychosocial Development and STEM Identity

Results related to RQ2 highlight the importance of psychosocial support mechanisms in strengthening students' confidence and sense of belonging within computing disciplines. Scholars consistently reported high levels of self-efficacy, with over 90% expecting to succeed in upper-division coursework.

These findings are consistent with Social Cognitive Career Theory (SCCT), which emphasizes the role of self-efficacy and environmental supports in shaping career trajectories (Lent et al., 1994). Faculty mentorship, cohort interactions, and professional development activities functioned as environmental supports that reinforced students' technical confidence and professional identity.

At the same time, qualitative findings revealed an important nuance: many students reported stronger belonging within the REP cohort than within the broader institutional environment. This phenomenon reflects what might be described as a "belonging paradox," in which program-level communities successfully foster inclusion even when broader institutional climates remain less supportive.

This observation aligns with prior research demonstrating that structured mentoring communities can buffer underrepresented students from experiences of marginalization in STEM fields (Crisp et al., 2017; Ong et al., 2018).

Career Readiness and Human Capital Development

Findings addressing RQ3 demonstrate that REP substantially strengthened scholars' career readiness. Workshop assessments revealed statistically significant gains across all professional development topics, with large effect sizes (Cohen's $d > 0.80$). These results indicate that the program did more than simply expose students to career information; it facilitated meaningful skill development aligned with hiring practices in computing industries.

Certification attainment increased from 13% to 37%, reflecting significant growth in the accumulation of career-relevant human capital. Certifications in areas such as cybersecurity and cloud administration serve as observable signals of technical competence, which are often valued by employers alongside formal degrees (Carnevale et al., 2020).

Graduate outcomes further support this interpretation. More than half of surveyed graduates reported employment shortly after graduation, and the majority of those employed held permanent, full-time positions in technology-related roles. These outcomes suggest that REP successfully translated internal confidence and academic preparation into external labor market opportunities.

From a theoretical perspective, these findings reinforce the career development pathway proposed by Social Cognitive Career Theory. By strengthening both self-efficacy and exposure to professional pathways, REP helped students transition from viewing themselves as learners to recognizing themselves as emerging technology professionals.

Integrated Support as a Mechanism for Equity

Taken together, the results demonstrate that the effectiveness of REP lies not in any single intervention, but in the integration of multiple support structures. Financial support reduces structural barriers, mentorship fosters belonging and identity formation, and professional development translates academic preparation into workforce readiness.

This integrated model aligns with emerging research suggesting that comprehensive support systems are more effective than isolated interventions in promoting persistence among underrepresented STEM students (Estrada et al., 2016). By addressing financial, psychosocial, and professional dimensions simultaneously, REP functions as a structured ecosystem for equity rather than simply a scholarship program.

Implications for Practice

The findings from the REP program suggest several practical strategies for institutions seeking to strengthen persistence and career readiness among students from low-income and historically underrepresented backgrounds in computing disciplines. The results indicate that effective interventions must provide integrated support systems that address financial stability, psychosocial development, and professional preparation simultaneously.

Integrated Support Models Are More Effective Than Single Interventions

One of the most important implications of this study is that financial aid alone is insufficient to address the complex barriers that underrepresented students face in STEM pathways. While scholarship funding reduced employment burdens and improved academic focus, the program's impact was amplified by the combination of mentorship and structured professional development activities.

Institutions designing scholarship programs should therefore consider implementing integrated support models that combine financial support with mentorship networks, career development workshops, and opportunities for professional engagement. These multi-dimensional interventions help create the conditions necessary for both academic persistence and workforce readiness.

Faculty Mentorship Plays a Critical Role in STEM Identity Formation

Faculty mentors emerged as a central component of the REP program's effectiveness. Beyond traditional academic advising, mentors served as cultural translators who helped students navigate the unwritten expectations of technology careers. Through individualized guidance, mentors helped scholars address technical skill gaps, overcome imposter syndrome, and understand industry expectations.

Institutions seeking to replicate successful mentorship models should prioritize structured mentor training and onboarding. Standardizing mentorship practices (e.g., encouraging open-ended problem exploration, adaptive mentoring strategies, and communication skill development) may improve the consistency and effectiveness of scholar mentorship experiences.

Professional Development Activities Should Be Embedded in Academic Programs

The impacts observed in workshop knowledge gains demonstrate that targeted professional development activities can significantly strengthen career readiness. Workshops focused on resume development, technical interviewing, networking, and certification pathways directly address competencies valued by technology employers and needed by scholars at the conclusion of their educational pathways.

Institutions should consider embedding career preparation programming within STEM degree pathways rather than offering it as optional extracurricular support. Integrating workshops, certification preparation, and networking opportunities into the curriculum may help students translate academic knowledge into workforce-relevant skills.

Cohort-Based Communities Can Strengthen Belonging in STEM

The findings suggest that cohort-based communities play an important role in fostering belonging among underrepresented students in computing fields. While scholars reported strong belonging within the REP program, some reported weaker connection to the broader institutional environment. This pattern suggests that structured learning communities can serve as protective spaces that support persistence even when broader institutional climates may be less inclusive.

Institutions may therefore benefit from implementing cohort-based learning models or scholarship communities that encourage peer support, collaborative learning, and shared professional development experiences.

Workforce Alignment Requires Early Career Exposure

Finally, the strong employment outcomes observed among graduates highlight the importance of connecting students with industry expectations early in their academic careers. Certifications, networking opportunities, and exposure to real-world career pathways helped scholars develop tangible signals of technical competence valued by employers.

Programs designed to support computing students should therefore prioritize industry engagement, including certification pathways, internship preparation, employer networking events, and career mentorship.

Limitations

Although the findings provide promising evidence regarding the effectiveness of the REP program, several limitations should be considered when interpreting the results.

Single-Institution Context

This study was conducted within a single institutional context—Miami Dade College. Institutional characteristics, such as student demographics, program structure, and regional workforce opportunities, may influence local outcomes. As a result, the findings may not fully generalize to other institutions with different student populations or program structures.

Future research should examine similar integrated programs across multiple institutions to determine whether the observed patterns hold across diverse educational contexts.

Self-Reported Survey Measures

Several outcomes—including self-efficacy, confidence, and perceptions of belonging—were measured using self-reported survey responses. While self-reported data are commonly used in educational research, they may be subject to response bias or social desirability effects. Students participating in scholarship programs may also feel motivated to report positive outcomes due to program affiliation.

To mitigate this limitation, the study triangulated survey responses with institutional academic data, workshop assessments, and graduate outcome surveys. Nonetheless, future research could strengthen measurement validity by incorporating additional behavioral indicators such as internship participation, portfolio development, or employer feedback.

Non-randomized Program Participation

REP participation was not randomly assigned. Students who applied for and received scholarships may differ in motivation, academic preparation, or career aspirations compared to non-participating students. Although statistical models controlled for several demographic variables, the possibility of selection bias remains.

Longitudinal or quasi-experimental research designs may help further isolate the causal effects of integrated support programs on student persistence and career outcomes.

Timing of Employment Outcomes

Employment outcomes were measured relatively soon after graduation. Because many graduates were still in the early stages of their career search at the time of the survey, the reported employment rates likely reflect early workforce entry rather than long-term career trajectories.

Future studies should examine longer-term career outcomes, including salary progression, career advancement, and continued engagement in technology fields.

These limitations do not diminish the value of the findings, but they do suggest that the results should be interpreted as strong evidence from a single institutional case rather than as universally generalizable outcomes.

Conclusion

The Rebooting through EmTech Program serves as a scalable framework for national STEM equity. By simultaneously addressing financial, psychosocial, and professional barriers, REP has fundamentally altered the career trajectories of its participants.

The human impact is summarized by the scholars themselves: "It changed my life entirely. I was able to graduate." Another reflected on the importance of the mentorship model, stating that mentors "made me feel like I truly belong in tech."

As the technology workforce continues to evolve, integrated support models—combining financial stability for debt reduction, expert mentorship for identity formation, and rigorous professional development—remain the most effective tools for ensuring underrepresented students become leaders in the digital economy.

Future research should examine whether the impacts observed in REP persist over time and can be replicated across other institutional contexts. Further longitudinal studies of graduates' career trajectories, multi-institutional evaluations of integrated scholarship models, and qualitative investigations of mentor–student interactions would deepen understanding of how financial support, belonging, and professional identity formation operate together in emerging technology education.

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References

Bandura, A. (1997). *Self-efficacy: The exercise of control.* W. H. Freeman.

Barker, L., McDowell, C., & Kalahar, K. (2009). Exploring factors that influence computer science introductory course students to persist in the major. *ACM SIGCSE Bulletin*, *41*(1), 153–157.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101.

Carnevale, A. P., Smith, N., & Strohl, J. (2020). *Recovery: Job growth and education requirements through 2030.* Georgetown University Center on Education and the Workforce.

Castleman, B. L., & Long, B. T. (2016). Looking beyond enrollment: The causal effect of need-based grants on college access, persistence, and graduation. *Journal of Labor Economics*, *34*(4), 1023–1073.

Chen, X. (2013). *STEM attrition: College students' paths into and out of STEM fields.* National Center for Education Statistics.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Crisp, G., Baker, V., Griffin, K., Lunsford, L., & Pifer, M. (2017). Mentoring undergraduate students. *Review of Educational Research*, *87*(2), 365–391.

Estrada, M., Burnett, M., Campbell, A., Campbell, P., Denetclaw, W., Gutiérrez, C., Hurtado, S., John, G., Matsui, J., McGee, R., Okpodu, C., Robinson, T., Summers, M., Werner-Washburne, M., & Zavala, M. (2016). Improving underrepresented minority student persistence in STEM. *CBE—Life Sciences Education*, *15*(3), es5.

Goldrick-Rab, S., Richardson, J., & Hernandez, A. (2016). *Hungry and homeless in college: Results from a national study of basic needs insecurity in higher education.* Wisconsin HOPE Lab.

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior*, *45*(1), 79–122.

Lewis, C., Yasuhara, K., & Anderson, R. (2021). Deciding to major in computer science: A grounded theory of students' self-assessment of ability. *ACM Transactions on Computing Education*, *21*(3).

National Academies of Sciences, Engineering, and Medicine (NASEM). (2016). *Barriers and opportunities for 2-year and 4-year STEM degrees: Systemic change to support diverse student pathways.* National Academies Press.

National Association of Colleges and Employers (NACE). (2023). *Career readiness defined.* National Association of Colleges and Employers.

Nguyen, T. D., Kramer, J. W., & Evans, B. J. (2019). The effects of grant aid on student persistence and degree attainment: A systematic review and meta-analysis of the causal evidence. *Review of Educational Research*, *89*(6), 831–874.

Ong, M., Smith, J. M., & Ko, L. T. (2018). Counterspaces for women of color in STEM higher education: Marginal and central spaces for persistence and success. *Journal of Research in Science Teaching*, *55*(2), 206–245.

Ramalingam, V., LaBelle, D., & Wiedenbeck, S. (2004). Self-efficacy and mental models in learning to program. *ACM SIGCSE Bulletin*, *36*(3), 171–175.

Tinto, V. (1994). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). University of Chicago Press.

U.S. Bureau of Labor Statistics. (2023). *Occupational Outlook Handbook: Computer and information technology occupations.* U.S. Department of Labor.

Walton, G. M., & Cohen, G. L. (2011). A brief social-belonging intervention improves academic and health outcomes of minority students. *Science*, *331*(6023), 1447–1451.

Students' Use of Generative Artificial Intelligence in Higher Education

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Abstract

Generative artificial intelligence (GenAI) is omnipresent these days. One of the key uses of GenAI in higher education (HE) is for enhancing students' learning experience through its ability to respond to user prompt to generate output. Text-to-text generators provide writing assistance to students. GenAI tools are useful research aids for generating ideas, synthesizing information, and summarizing an immense amount of information (Chan & Hu, 2023). Nonetheless, gaps in the literature for future research regarding an understanding of the possibilities provided through GenAI in HE has been identified, e.g. by Crompton and Burke (2023). Such gaps include studies conducted in disciplines like general business management and studies focusing on detecting unexplored possibilities on GenAI in HE. The goal of this paper is to contribute to the ongoing research activities in the field of GenAI in HE in two ways. Firstly, by summarizing the existing literature on GenAI in HE, focusing on its impact on students' learning processes. And secondly, by the empirical results from a qualitative survey conducted in general management course classes in the Business Information Technology Bachelor's degree program (BIT) at the University of Applied Sciences and Arts Northwestern Switzerland (FHNW) in autumn 2025. The survey results provide insight into the extent to which students use GenAI, as well as which GenAI tools are used for which activities in HE.

Keywords: artificial intelligence, generative artificial intelligence, generative pretrained transformers, gioia methodology, higher education, large language model, more knowledgeable other, unified theory of acceptance and use of technology

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Introduction

The evolution of the computer and the field of artificial intelligence (AI) have been a gradual process that has spanned several decades and involved numerous steps (Grzybowski et al., 2024). Alan Mathison Turing (1912–1954) was a British mathematician, computer scientist and military officer. He is widely regarded as a seminal figure in the fields of computer science and AI. The term "AI" was first coined by John McCarthy in name the Darthmouth College Summer Artificial Intelligence Conference, which was held at Dartmouth College (Hannover, New Hampshire, USA) in 1956 (Grzybowski et al., 2024).

AI is defined as "computing systems that are able to engage in human-like processes such as learning, adapting, synthesizing, self-correction and the use of data for complex processing tasks" (Almassaad et al., 2024).

In November 2022, OpenAI released ChatGPT, a conversational artificial intelligence interface that uses natural language processing (NLP) to interact in a realistic way. It even answers follow-up questions, admits its mistakes, challenges incorrect premises and rejects inappropriate requests (OpenAI, 2022). Within the broad domain of AI, GenAI signifies a particularly auspicious technological development, but it also hallucinates, which is an inherent problem of all large language model (LLM).

GenAI can be used to create new content, including audio, code, images, text, simulations and videos (Kohnke et al., 2023). In contrast to conventional data processing and analysis, GenAI employs these advanced methods to create content directly (Almassaad et al., 2024). Subsequently, a range of other GenAI tools, including Gemini, Notebook LM, Perplexity, Claude etc., were released into the market.

Several studies highlighted the lack of empirical research and the need for further investigation into the benefits and challenges of using GenAI in HE (Almassaad et al., 2024). A gap regarding the understanding of the collective affordances provided using AI in HE has been noted (Crompton & Burke, 2023). Future analysis is needed to address variations in results based on different prompts or words used with ChatGPT (Andrade-Girón et al., 2024).

Literature Review

This section reviews part of the literature on GenAI tools in HE, identifying some contributions, challenges and opportunities.

Several research papers that focus on the opportunities and challenges of GenAI in HE has been identified by the authors. For example, Ruiz-Rojas et al. (2024) identifies that integration of GenAI tools in HE has a positive impact on the development of student's critical thinking.

Nikolopoulou (2024) summarizes that ChatGPT can generate new content and human-like responses. She mentions various positive aspects such as personalized/adaptive learning experience, editing, abstracting, language translation, research aid, as well as grading and assessment. According to Nikolopoulou's research, the challenges include cheating in assignments, overreliance on the AI tools, ethical and privacy concerns, as well as uncertainty/anxiety among students about their future careers (Nikolopoulou, 2024).

Investigations have been undertaken that focus on the systematic review of the topic. Andrade-Girón et al. (2024) investigates the acceptance, validity, usefulness, and time optimization of ChatGPT in HE by a systematic literature review covering publications between 2022 to 2024. The researchers reveal diverse global contributions predominantly from Asia and identify prevalent quantitative research among the studies. Also, Crompton and Burke (2023) performed a systematic review of AI in HE covers the years 2016 to 2022. According to their work 72% of the studies under examination focus on students' intended use of AI. AI in HE was used for assessment/evaluation, predicting, AI assistant, intelligent tutoring system, and managing student learning.

Stojanov (2023) highlights that ChatGPT acts as a more knowledgeable other (MKO). She highlighted some red flags, e.g. that information provided by ChatGPT is not always consistent or logical, in some cases even contradicting. Sometimes ChatGPT provide opposite answers for the exact same questions. Tlili et al. (2023) also mentions honesty and truthfulness beside cheating, privacy misleading, and manipulation. Yusuf et al. (2024) highlight ChatGPT's prominence due to its adaptability for tasks such as content generation and questions answering.

Zhu et al. (2025) conclude that the ability of GenAI to generate and automate processes significantly contributes to students learning experiences. The research paper synthesized findings from 26 empirical research studies to evaluate the influence of GenAI on students learning outcomes. Almassaad et al. (2024) list personalized and immediate learning support, provision of automated personalized assistance and feedback, virtual teaching assistance, time savings, enabling access to information, offering quality explanations and clarification, promoting critical thinking skills, research aid for brainstorming and generating writing ideas and analyzing data and group work and collaboration as beneficial.

The authors summarize that most research articles discovered many opportunities and challenges of GenAI, with major focus on the prominent GenAI tool ChatGPT, based on various research methods, some of them using the theoretical framework of the unified theory of acceptance and use of technology (UTAUT), or any predecessor models of UTAUT e.g. TAM (Meakin, 2024; Shahzad et al., 2025) and extensions/variations of UTAUT. Only limited number of contributions provide deeper insight into the relationship between behavioral intention and use behavior, two major elements of UTAUT, as illustrated in figure 1 below.

Aldreabi et al. (2025) refer to multiple research that showcased the great potential of GenAI in education using UTAUT2. In comparison to UTAUT, UTAUT2 includes more elements. The researchers hypothesize, besides other hypothesis, that the behavioral intention has a positive linear impact on HE student's use of GenAI tool. Zhao et al. (2024) also see it the same.

The lack of understanding of the relationship between behavioral intention and use behavior, two elements in the UTAUT, drive the research question of this paper: "Why, how, and in what way do students use GenAI tools in class? Also, which specific GenAI tools do they use?"

Methodology

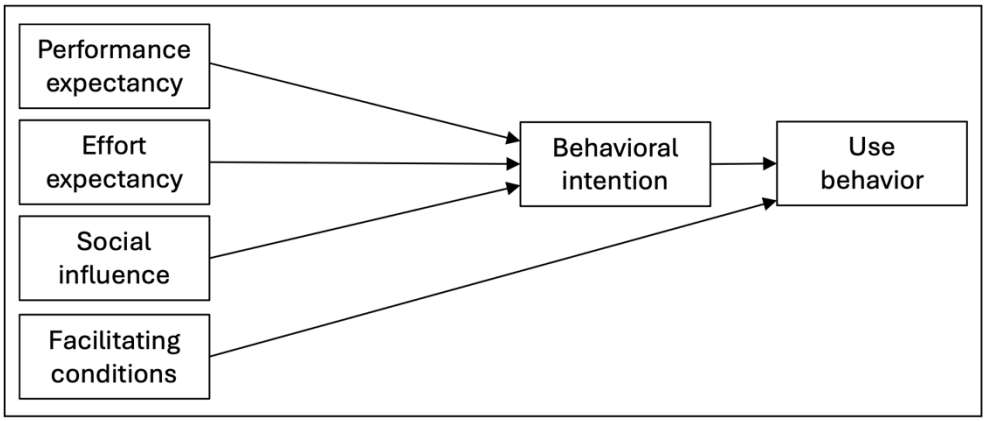
The theoretical framework for the research question as mentioned above and derived by the researchers through the literature review is the Unified theory of acceptance and use of technology (UTAUT). UTAUT was developed as a comprehensive synthesis of eight prior technology acceptance models by Venkatesh et al. (2003). UTAUT has four key constructs, which are performance expectancy, effort expectancy, social influence, and facilitation conditions. Those four influence behavioral intention to use a specific technology.

Performance expectancy is defined as the degree to which using technology is expected to provide benefits to consumers in performing certain activities. Effort expectancy is the degree of ease associated with consumers' use of technology. Social influence stands to the extend wo which consumers perceive important others (e.g. fellow students, friends) believe they should use a certain technology. Facilitating conditions refer to consumers' perceptions of the resources and support available to perform a behavior.

According to UTAUT, performance expectancy, effort expectancy, and social influence are theorized to influence behavioral intention to use technology, while behavioral intention and facilitating conditions determine technology use.

The original UTAUT was subsequently extended several times. The extensions have not been done with careful theoretical considerations (Venkatesh et al., 2012). In addition, UTAUT already explains as much as 70% of the variance in intention (Venkatesh et al., 2003). The two arguments, 1) extension without careful theoretical consideration, and 2) UTAUT already explains 70% of the variance in intention are strengthen authors' decision to stick to the UTAUT model, rather than rely on extended version of the UTAUT model.

Figure 1
UTAUT



Source: Venkatesh et al. (2003)

The empirical part of this research paper is grounded on the Gioia methodology (GM) (Gioia et al., 2013). Gioia et al. (2013) argued that "researchers need to consider data and existing theory in tandem - as a combination of 'knowing' and 'not knowing' – and as fine balancing act that allows for discovery without reinventing the wheel." First, GM is about taking a higher-level perspective to develop the 1st-order concepts by building on students' words. Second, the analytical process enabling the development of 2nd-order themes and aggregate dimensions consists of interweaving induction and abduction, the latter promoting the creative process of theoretical development which ideally is knowledge enriching (Magnani

& Gioia, 2023). The GM results can affirm, extend or generate the theoretical framework (Magnani & Gioia, 2023).

The empirical research was designed as a qualitative study (Braun et al., 2021; Jansen, 2010). The authors conducted an online survey using Google Forms. The introduction to the survey was done face-to-face in class end of November/beginning of December 2025. The students had time to answer the questions online, anonymously, and as free-writing text. 106 students (N), divided into three classes of the exact same course, received the link to the online questionnaire on Google forms. Of the 106 students, 54 students (n) filled out the questionnaire (51%).

The questionnaire was kept rather short with seven questions, to motivate participants to participate. The questions are disclosed below.

Figure 2
Online Survey Questionnaire

Q1: What is your age, gender and nationality?

Q2: Describe the most common case, activity, question, exercise etc. for which you use generative artificial intelligence (GenAI) in the PoM course.

Q3: Which GenAI tool are you using for the most common case, activity, question, exercises etc. the PoM course?

Q4: Explain in detail how you use GenAI, distinguish in as much detail as possible for each step in the process of use for the case, activity question, exercise etc.

Q5: Why did you use GenAI for this case, activity, question, exercise etc.?

Q6: What is your major challenge when using the GenAI tool?

Q7: What is your level of knowledge about the GenAI tool used?

Note. PoM is the abbreviation for Principles of Management

The data received from students answers to the questionnaire is structured based on GM. The core of this qualitative approach is theory-building, in this research paper theory-supporting and theory-extension, from empirical data (Jiménez-Partearroyo et al., 2024).

GM enables transitioning from concrete data to abstract theoretical insight, enriching qualitative research. Key steps of GM as used in this paper are:

1. Data collection: The primary data collection method of a qualitative questionnaire was used. The questions are designed along the UTAUT theory.
2. Data analysis: It involved a detailed examination of the answer text to discover underlying patterns (1-st order concepts), themes (2-nd order themes), and dimensions (aggregate dimensions) (Gehman et al., 2018).
3. Conceptual framework: Instead of developing a conceptual framework, we decided to use the UTAUT model.
4. Theory alignment: By interpreting the data within its conceptual framework UTAUT, we aimed to assign, reject, or extend the UTAUT and therefore deepen the understanding of the subject matter (Olbrich & Mueller, 2013; Tucker, 2016).

For step 2 “data analysis” the authors analyzed students’ responses using GM for inductive qualitative research (Gioia et al., 2013). In the first step, we conducted open coding to identify 1st-order concepts that closely reflected students’ own terms and expressions regarding their use of GenAI in a general management course. This resulted in a diverse set of informant-centric concepts capturing purposes of use, interaction practices, tool choices, and perceived risks.

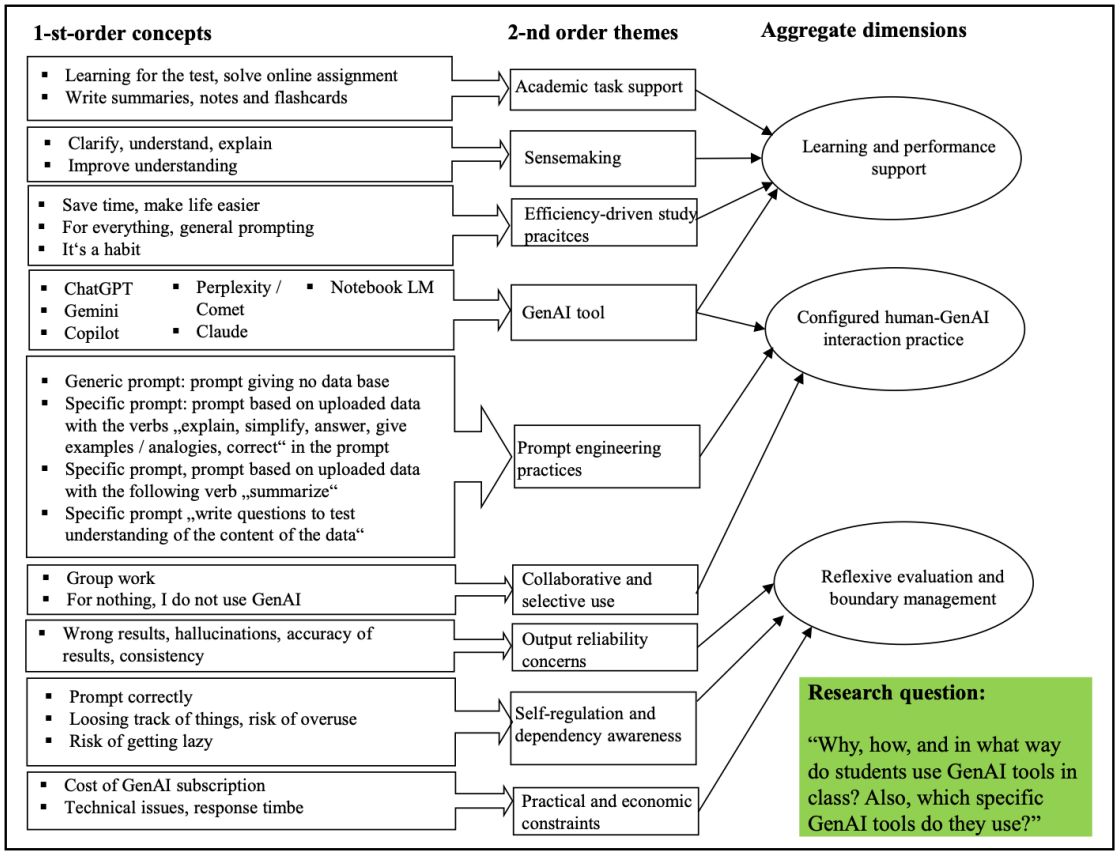
In a second step, we engaged in axial coding (Simmons, 2018) to group these 1st-order concepts into 2nd-order themes that reflected emerging patterns and similarities across responses, while moving toward more abstract, researcher-centric interpretations. These themes captured distinct but related aspects of instrumental learning support, modes of human-GenAI interaction, and reflexive evaluations of GenAI use.

Finally, we aggregated the 2nd-order themes into three overarching aggregate dimensions that theoretically explain “Why, how, and in what way do students use GenAI tools in class? Also, which specific GenAI tools do they use?” Throughout the analysis, we iterated between data and theory to ensure that emerging interpretations remained grounded in student accounts while contributing to a more generalizable understanding of GenAI use HE.

Results

Figure 2 below shows the data structure as the result of the application of the GM to the collected data and the data analysis thereon.

Figure 3
Data Structure Using GM



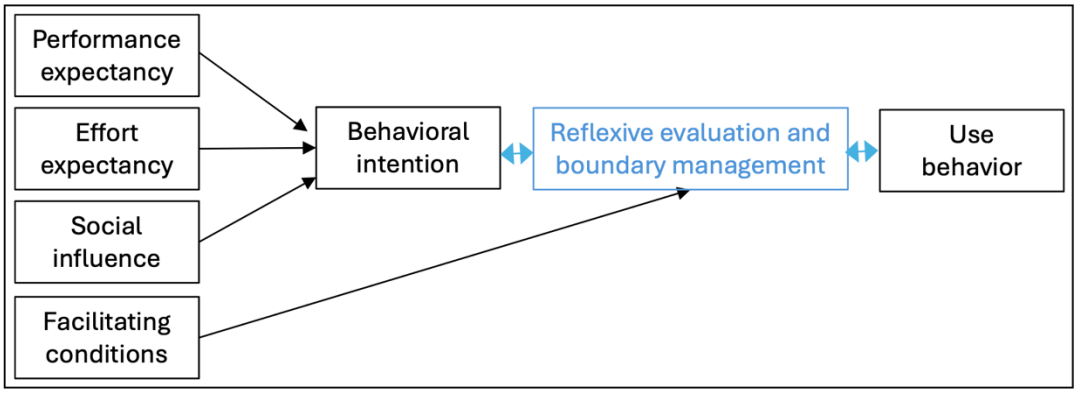
Note. Data structure using GM (Gioia et al., 2013). *Source:* Authors’ compilation from questionnaire.

Findings and Discussion

Using GM, the analysis revealed a rich, practice-oriented picture of GenAI use that can be meaningfully interpreted through the UTAUT, while also pointing to important limitations of the model in its current form. In what follows, we first discuss the GM findings in relation to core UTAUT constructions. We then argue for an extension of UTAUT that incorporates reflexive evaluation and boundary management as a central explanatory mechanism in higher educational GenAI use.

To simplify readers orientation, the UTAUT model with the extension of "reflexive evaluation and boundary management" is drawn below.

Figure 4
Proposed UTAUT Extension



Source: Authors extension (in blue) of UTAUT based on data structure from GM

Consistent with UTAUT, the findings indicate that performance expectancy is a central driver of students' GenAI use (Venkatesh et al., 2013; Zhao et al., 2024). Students primarily engage with GenAI because they expect it to enhance their academic performance by supporting learning for tests, solving assignments, clarifying complex concepts, and improving understanding. These expectations are not abstract or speculative. Rather, they are grounded in concrete practices such as generating summaries, writing and structuring notes, producing flashcards, and formulating explanations and questions tailored to course content.

Importantly, performance expectancy in this context extends beyond traditional efficiency or productivity gains. Students view GenAI as a cognitive aid that supports sensemaking in a general management course characterized by conceptual complexity. This broader interpretation of performance expectancy aligns with prior UTAUT research in knowledge-intensive settings, while also highlighting that in educational contexts, perceived performance gains may be defined in terms of understanding and comprehension rather than output alone (Menon & Shilpa, 2023).

The habitual nature of the use of GenAI further reinforces performance expectancy. Once students experience GenAI as effective in supporting their learning-related goals, use becomes routinized, confirming UTAUT's proposition that positive performance beliefs strengthen continued use behavior.

The findings also strongly support the role of effort expectancy in shaping GenAI use. Students differentiate between generic prompts and more specific, data-based prompting strategies, demonstrating that perceived ease of use is not inherent to the technology but

emerges through learned interaction practices. Once students develop basic prompting competencies – such as uploading materials and using directive verbs like "explain," "simplify," or "summarize" – interaction with GenAI becomes low-effort and efficient.

The use of multiple GenAI tools (e.g., ChatGPT, Gemini, Perplexity, Notebook LM) further illustrates how students actively configure their technological environment to minimize effort while maximizing usefulness. Over time, these configurations contribute to habitual use, reducing the perceived cognitive and operational costs of engaging with GenAI. These findings align closely with UTAUT's emphasis on effort expectancy as a determinant of behavioral intention, while also suggesting that effort expectancy is dynamically constructed through use rather than fixed at adoption.

Social influence plays a more limited but still visible role in students' GenAI use. The GM shows that GenAI is used in group work settings, indicating that peer context contributes to the normalization of GenAI as an acceptable academic tool. This is in line with the promotion of corporation, highlighted in research by Cordero et al. (2025). And aligns with UTAUT's assertion that social norms can shape behavioral intentions, particularly in early stages of technology diffusion.

However, the findings also show that social influence does not lead to uniform or uncritical use. Students report selective GenAI abstinence in certain situations and activities suggesting that peer acceptance does not override individual judgments about appropriateness. This nuanced role of social influence indicates that, in HE contexts, students retain substantial autonomy in shaping their technology use, even when use is socially legitimized.

UTAUT conceptualizes facilitating conditions as "the degree to which users believe that organizational and technical infrastructure supports technology use." The findings through GM confirm the relevance of such conditions, including subscription costs, technical issues, and response time. These factors directly affect students' ability to access and rely on GenAI tools.

However, GM also reveals that facilitating conditions in GenAI use extend beyond infrastructure to include output reliability and epistemic quality. Student's express concerns about hallucinations, inaccuracies, and inconsistent results, indicating that trust in the technology's outputs is a critical condition for sustained use. These concerns shape not only whether GenAI is used, but how cautiously and selectively it is applied. This finding suggests that in GenAI in HE contexts, facilitating conditions must be understood as both technical and epistemic in nature.

While UTAUT provides a robust framework for explaining students' intentions to use GenAI, the GM findings indicate that behavior intention alone does not fully explain actual use behavior in HE. Students with high performance and effort expectancy do not necessarily maximize their use of GenAI. Instead, they actively negotiate how much, when, and for what GenAI should be used. To account for this pattern, we propose "reflexive evaluation and boundary management" as a theoretically meaningful extension to UTAUT. See figure 4 above for the proposed UTAUT extension.

Reflexive evaluation and boundary management refers to users' ongoing evaluation and regulation of their engagement with GenAI based on perceived risks, limitations, and normative concerns. In this study, students articulate boundaries related to accuracy,

dependency and overuse. They express concerns about "getting lazy," "losing track," or relying too heavily on GenAI, even as they continue to use it regularly. This goes somehow into the same direction as the concerns about potential impact on creativity and critical thinking reported by Malik et al. (2023).

Other research also detected risk of using GenAI, which are "hindering the development of their own writing skills" (Nelson et al., 2025). Johnston et al. (2024) disclosed in their research work, "student who had higher level of confidence in their academic writing where less likely to use or consider using GenAI for academic purposes."

Crucially, reflexive evaluation and boundary management is not equivalent to resistance or rejection. Rather, it operates as a filter between behavioral intention and actual use. Students intend to use GenAI because they perceive it as useful and easy to use, but they modulate their behavior based on reflexive judgments about appropriate use.

Proposed UTAUT Extension

Introducing reflexive evaluation and boundary management extends UTAUT in three ways.

First, it problematizes the assumption of a largely linear relationship between intention and use. In educational GenAI contexts, high intention can coexist with restrained or selective use, driven by reflective considerations rather than lack of acceptance.

Second, it reframes facilitating conditions to include epistemic trust and perceived risks. Boundary management emerges precisely because GenAI outputs are probabilistic and occasionally unreliable, requiring users to actively assess when reliance is justified.

Third, it challenges the notion that habit necessarily leads to increased or uncritical use. The findings show that habitual GenAI use can coexist with continuous evaluation and boundary-setting, suggesting that habit and reflexivity are not mutually exclusive.

Based on these findings, we propose extending UTAUT by positioning reflexive evaluation and boundary management as a moderating mechanism between behavioral intention and actual use behavior. This construct explains why students who strongly accept GenAI do not always use it extensively or indiscriminately. Instead, use behavior reflects a balance between acceptance-driven motivation and reflexive judgment. The proposed UTAUT extension is illustrated in figure 4 above.

Incorporating reflexive evaluation and boundary management into UTAUT enhances its explanatory power by accounting for the distinctive characteristics of GenAI-based systems and the reflective agency of student users.

Conclusion

In sum, the GM demonstrates that students' GenAI use in a general management course aligns strongly with core UTAUT constructs, particularly performance expectancy and effort expectancy. At the same time, the findings reveal systematic patterns of reflexive evaluation and boundary-setting that are not fully captured by the original model. By introducing reflexive evaluation and boundary management as an extension to UTAUT, this study contributes a context-sensitive theoretical refinement that better explains GenAI use in HE.

Rather than passive adopters, students emerge as reflective users who actively shape the role of GenAI in HE.

Limitations

Due to its specific context this study has several limitations. These include potential biases in self-reported data and a narrow focus on business information technology (BIT) students in a general management course in HE.

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

The author declares that Deepl and ChatGPT, AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from Deepl and ChatGPT no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Aldreabi, H., Dhadoul N., Alhur, M., Alzboun N., & Alsalhi, N. (2025). Determinants of Student Adoption of Generative AI in Higher Education. *Electronic Journal of e-Learning, 23*(1), 15–33. https:// doi.org/10.34190/ejel.23.1.3599

Almassaad, A., Alajlan, H., & Alebaikan, R. (2024). Student Perceptions of Generative Artificial Intelligence: Investigating Utilization, Benefits, and Challenges in Higher Education. *Systems 2024, 12*, 385. https:// doi.org/10.3390/systems12100385

Andrade-Girón, D., Marín-Rodriguez, W., Sandivar-Rosas, J., Carreño-Cisneros, E., Susanibar-Ramirez, E., Zuñiga-Rojas, M., Angeles-Morales, J., & Villarreal-Torres, H. (2024). Generative artificial intelligence in higher education learning: A review based on academic databases. *Iberoamerican Journal of Science Measurement and Communication, 4(*1), 1–16. https://doi.org/10.47909/ijsmc.101

Braun, V., Clarke, V., Boulton, E., Davey, L., & McEvoy, Ch. (2021). The online survey as a qualitative research tool. *International Journal of Social Research Methodology, 24*(6), 641–654. https://doi.org/10.1080/13645579.2020.1805550

Chan, C. K. Y., & Hu, W. (2023). Students' voice on generative AI: perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education, 20*(43). https://doi.org/10.1186/s41239-023-00411-8

Cordero, J., Torres-Zambrano, J., & Cordero-Castillo, A. (2025). Integration of Generative Artificial Intelligence in Higher Education: Best Practices. *Education Sciences, 15*(1), 32. https://doi.org/ 10.3390/educsci15010032

Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: the state of the field. *International Journal of Educational Technology in Higher Education, 20*(22). https://doi.org/10.1186/s41239-023-00393-8

Gehman, J., Glaser, V. L., Eisenhardt, K. M., Gioia, D., Langley, A., & Corley, K. G. (2018). Finding theory-method fit: A comparison of three qualitative approaches to theory building. *Journal of Management Inquiry, 27*(3), 284–300. https://doi.org/10.1177/1056492617706029

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the gioia methodology. *Organizational Research Methods, 16*(1), 15–31. https://doi. org/10.1177/1094428112452151

Grzybowski, A., Pawlikowska–Łagód, K., & Lambert, C. (2024). A History of Artificial Intelligence. *Clinics in Dermatology, 42*(3), 221–229. https://doi.org/10.1016/j.clindermatol.2023.12.016

Jansen, H. (2010). The Logic of Qualitative Survey Research and its Position in the Field of Social Research Methods. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 11*(2), Article 11. http://nbn-resolving.de/urn:nbn:de:0114-fqs1002110

Jiménez-Partearroyo, M., Medina-Lopez, A., & Rana, S. (2024). Business intelligence and business analytics in tourism: insight through Gioia methodology. *International Entrepreneurship and Management Journal, 20*, 2287–2321. https://doi.org/10.1007/s11365-024-00973-7

Johnston, H., Wells, R. F., Shanks, E. M., Boey, T., & Parsons, B. N. (2024). Student perspectives on the use of generative artificial intelligence technologies in higher education. *International Journal of Educational Integrity, 20*, 2. https://doi.org/10.1007/s40979-024-00149-4

Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). Exploring generative artificial intelligence preparedness among university language instructors: A case study. *Computers and Education: Artificial Intelligence, 5*, Article 100156. https://doi.org/10.1016/j.caeai.2023.100156

Magnani, G., & Gioia, D. (2023). Using the Gioia Methodology in international business and entrepreneurship research. *International Business Review, 32*(2), Article 102097. https://doi.org/10.1016/j.ibusrev.2022.102097

Malik, A. R., Pratiwi, Y., Andajani, K., Numertayasa, I. W., Suharti, S., Darwis, A., & Marzuki. (2023). Exploring Artificial Intelligence in Academic Essay: Higher Education Student's Perspective. *International Journal of Educational Research Open, 5*, Article 100296. https://doi.org/10.1016/j.ijedro.2023.100296

Meakin, L. (2024). Exploring the Impact of Generative Artificial Intelligence on Higher Education Students' Utilization of Library Resources: A Critical Examination. *Information technology and libraries, 43*(3). https://doi.org/10.5860/ital.v43i3.17246

Menon, D., & Shilpa, K. (2023). "Chatting with ChatGPT": Analyzing the factors influencing users' intention to Use the Open AI's ChatGPT using the UTAUT model. *Heliyon, 9*(11), 20962. https://doi.org/10.1016/j.heliyon.2023.e20962

Nelson, A. S., Santamaría, P. V., Javens, J. S., & Ricaurte, M. (2025). Students' Perceptions of Generative Artificial Intelligence (GenAI) Use in Academic Writing in English as a Foreign Language. *Education Sciences, 15*(5), 611. https://doi.org/10.3390/educsci15050611

Nikolopoulou, K. (2024). Generative Artificial Intelligence in Higher Education: Exploring Ways of Harnessing Pedagogical Practices with the Assistance of ChatGPT. *International Journal of Changes in Education, 1*(2), 103–111. https://doi.org/10.47852/bonviewIJCE42022489

Olbrich, S., & Mueller, B. (2013). Towards a framework for structuring theory in IS research. *Proceedings of the Nineteenth Americas Conference on Information Systems, Chicago, Illinois, August 15–17, 2013.*

OpenAI. (2023). *ChatGPT: Optimizing language models for dialogue*. https://openai.com/blog/chatgpt/

Ruiz-Rojas, L. I., Salvador-Ullauri, L., & Acosta-Vargas, P. (2024). Collaborative Working and Critical Thinking: Adoption of Generative Artificial Intelligence Tools in Higher Education. *Sustainability 2024, 16*, 5367. https://doi.org/10.3390/ su16135367

Shahzad, M. F., Xu, S., & Asif, M. (2025). Factors affecting generative artificial intelligence, such as ChatGPT, use in higher education. An application of technology acceptance model. *British Educational Research Journal, 51*, 489–513. https://doi.org/10.1002/berj.4084

Simmons, N. (2018). Axial coding. In M. Allen (Ed.), *The SAGE encyclopedia of communication research methods*. SAGE Publications, Inc. https://doi.org/10.4135/9781483381411

Stojanov, A. (2023). Learning with ChatGPT 3.5 as a more knowledgeable other: an authoethnographic study. *International Journal of Educational Technology in Higher Education, 20*(35). https://doi.org/10.1186/s41239-023-00404-7

Tlili, A., Shehata, B., Adarkwah, M.A., Bozkurt, A., Hickey, D.T., Huang, R.,& Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments, 10*, 15. https://doi.org/10.1186/s40561-023-00237-x

Tucker, T. N. (2016). Grounded theory generation: A tool for transparent concept development. *International Studies Perspectives, 17*(4), 426–438. https://doi.org/10.2139/SSRN.2685879.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*(3), 425–478.

Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly, 36*(1), 157–178.

Yusuf, A., Pervin, N., & Roman-Gonzales, M. (2024). Generative AI and the future of higher education: a threat to academic integrity or reformation? Evidence from multicultural perspectives. *International Journal of Educational Technology in Higher Education, 21*, 21. https://doi.org/10.1186/s41239-024-00453-6

Zhao, L., Rahman, Md. H., Yeoh, W., Wang, S., & Ooi, K.B. (2024). Examining factors influencing university students' adoption of generative artificial intelligence: a cross-country study. *Studies in Higher Education, 50*(12), 2646–2668. https://doi.org/10.1080/03075079.2024.2427786

Zhu, Y., Liu, Q., & Zhao L. (2025). Exploring the impact of generative artificial intelligence on students' learning outcomes: a meta-analysis. *Education and Information Technologies, 30,* 16211–16239. https://doi.org/10.1007/s10639-025-13420-z

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Cultivating Relational Leadership and Wellbeing Through CARE: A Service-Learning Approach in Teacher Preparation

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Abstract

This paper presents the CARE framework: Compassion, Accountability, Reflection, and Engagement—as a relational model for cultivating teacher leadership and wellbeing in pre-service teacher education. The project illustrates this enactment through service-learning projects designed and implemented by four student teachers at Georgia Gwinnett College, during Spring 2024 and Spring 2025. Informed by engaged pedagogy, social and emotional learning, CARE positions leadership not as positional authority but as ethical, relational, and community-responsive practice. Each component of the framework is elaborated below conceptually and is grounded in empirical illustration. The goal is to demonstrate how pre-service teachers develop leadership dispositions and skills through relationships and community-engaged work. Service-learning provides an especially rich pedagogical site for enacting CARE, as it relies on reciprocal engagement that is informed by accountability and continuous reflection across institutional and community spaces.

Keywords: service-learning, wellbeing, leadership, teacher education

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Introduction: Reconceptualizing Teacher Leadership

Contemporary classrooms require leadership that is relational, ethical, and emotionally responsive. Since COVID-19 there has been a growing concern in the teaching profession about teacher burnout and teacher retention (Day & Gu, 2010). These issues call for models of teacher leadership that are sustainable and integrate wellbeing into professional development. In this paper I propose the CARE framework as a conceptual model that connects leadership and wellbeing through relational practice. Scholarship on teacher leadership has consistently moved beyond narrow definitions of leadership as administrative authority toward more expansive understandings of influence within school communities. York-Barr and Duke (2004), for example in their foundational review, define teacher leadership as teachers' capacity to influence colleagues, administrators, and school practices to improve teaching and learning. Danielson (2006) similarly argues that teacher leadership is best understood as a set of professional practices that strengthen instruction from within, rather than a formal role layered on top of teaching. Similarly, Katzenmeyer and Moller (2009) argue that teachers represent a sleeping giant of leadership potential embedded in their professional expertise and collaborative practice. Distributed leadership theorists such as Spillane (2006) shift the lens further and conceptualize leadership as stretched across people and situations. Muijs and Harris (2003) connect teacher leadership to school improvement, and they argue that empowering teachers fosters collective responsibility and organizational learning. This aligns with Hargreaves and Fullan's (2012) concept of professional capital, which frames teachers' collective expertise and collaborative capacity as a resource that strengthens the profession as a whole. Scholars of care and relational ethics, particularly Noddings (1984/2013), expand leadership discourse by foregrounding the moral and relational dimensions of educational practice. She emphasizes that educational influence is grounded in attentiveness and ethical responsibility. Grogan and Shakeshaft (2011) similarly document how women's leadership in education has often emerged through relational and collaborative practice and reinforces this broader shift in how leadership is conceptualized. Across this body of work, leadership is understood less as positional power and more as a form of relational influence that is collaborative and emerges through interaction and shared practice. What is underdeveloped is the explicit integration of wellbeing into teacher leadership theory. This gap creates space for frameworks such as CARE to conceptually align relational leadership and professional sustainability.

While existing scholarship has advanced relational understandings of teacher leadership, these frameworks often treat wellbeing as an adjacent outcome and not as an integral part of leadership practice itself. The CARE framework addresses this gap by conceptualizing leadership and wellbeing as mutually constitutive processes implemented through relational practice. Rather than positioning care, reflection, or engagement as discrete dispositions, CARE offers an integrative model that explains how these dimensions interact to support both professional agency and wellbeing. In doing so, the framework shifts the discourse of leadership as influence alone toward leadership as ethically and emotionally sustained practice.

The CARE Framework

In order to conceptualize teacher leadership and wellbeing as relational, ethical, and practice-based dimensions of teacher education, I developed the CARE framework based on my work in teacher education and wellness (Varga-Dobai, 2024, 2026), drawing on my professional expertise in teacher preparation, specifically service-learning course design, research on leadership development, social and emotional learning (SEL), and wellbeing. In this

framework I do not position CARE as an individual trait or sentiment; the CARE framework instead conceptualizes care as a pedagogical framework that must be intentionally designed and reflected upon within teacher education programs.

The CARE framework consists of four interrelated dimensions: Compassion, Accountability, Reflection, and Engagement. Together, these dimensions offer a coherent structure to understand how teacher leadership and wellbeing are cultivated through practice as experiential and community-engaged pedagogies. CARE positions leadership not as positional authority or managerial function, but as relational influence that is informed and enacted through ethical responsibility, emotional attunement, and community responsiveness. Its goal is to integrate leadership development and wellbeing rather than treating them as separate or competing outcomes. Within this framework, wellbeing is relational and practice-embedded, and leadership is perceived as care-informed action.

Compassion

Within the CARE framework, compassion refers to relational trust, emotional attunement, and responsiveness to students' lived experiences and needs. Compassion is not framed as sentimentality, but as a leadership capacity that shapes how teachers interpret student behavior, how they design learning environments, and how they respond to moments of tension or disruption in the classroom. Thus, compassion functions as a foundational leadership approach that emphasizes understanding and relational safety. In teacher education, compassion is cultivated through pedagogical and instructional practices that attend to students' social and emotional as well as academic needs and encourage pre-service teachers to interpret classroom challenges as communicative acts rather than behavioral deficits. As such, compassion supports both leadership development and wellbeing by creating emotionally safe spaces for learning and risk-taking.

Accountability

Accountability, as conceptualized in the CARE framework, extends beyond compliance or evaluation. It is understood as an ethical responsibility to oneself, students, families, and the larger community. CARE reframes accountability as relational and reciprocal rather than punitive or hierarchical. Teacher leadership, from this perspective, involves advocacy, attentiveness, and responsibility for the broader social, emotional, ethical and academic dimensions of teaching. Within teacher education programs, accountability is practiced through sustained commitment to community partnerships, responsiveness to local needs, and ongoing consideration of power and responsibility in the service of student success. For pre-service teachers, accountability contributes to wellbeing because it grounds leadership in personal responsibility and purpose. Accountability also supports pre-service teachers in perceiving responsibility as dispositional practice rather than an expectation that must be performed.

Reflection

Reflection is the mechanism through which CARE is cultivated and evaluated. In the CARE framework, reflection is an ongoing and critical practice that supports leadership identity development, strengthens ethical decision-making and professional growth. Reflection is not treated as an add-on or culminating task, but as a central pedagogical and instructional practice that is embedded throughout coursework and the clinical experiences of the teacher training program. Through reflective practice, pre-service teachers examine their assumptions,

positionality, their own teaching, and emerging role as teacher-leaders. Reflection also allows compassion and accountability to develop as a dispositional skill through sustained practice while also reinforcing the interdependence of leadership and wellbeing.

Engagement

Within the CARE framework, engagement refers to reciprocal, community-based participation that positions students, families, and community members as partners in the educational process. Engagement is not limited to participation but foregrounds involvement and collaboration that is grounded in mutual respect and shared responsibility. Service-learning provides a powerful context for enacting engagement as a leadership practice, as it allows pre-service teachers to work alongside families and communities in ways that expand traditional definitions of school-based involvement. Engagement supports both leadership and wellbeing, and strengthens CARE as a framework by building relational capacity through problem-solving and communication.

CARE and the Interdependence of Leadership and Wellbeing

The CARE framework conceptualizes leadership development and wellbeing as interdependent processes within teacher education. Rather than looking at leadership as an external skill set or administrative function, CARE frames leadership as relational practice grounded in compassion, accountability, reflection, and engagement. In this model, wellbeing becomes a condition that emerges from these four components through ethically grounded and emotionally attuned practice. Leadership and wellbeing are therefore mutually constitutive: each sustains and deepens the other. Within CARE, leadership is conceptualized and enacted through collaboration and relational influence rather than positional authority, constituting wellbeing in the following ways:

- Compassion fosters trust and responsiveness
- Accountability anchors action in ethical responsibility
- Reflection supports adaptive awareness
- Engagement situates leadership within reciprocal community relationships

These dimensions do not function independently as leadership principles. Compassion without accountability risks becoming sentimentality; accountability without compassion risks rigidity; reflection without engagement risks abstraction; engagement without reflection risks reactivity. These tensions are lived dilemmas in practice. For example, efforts to enact compassion in high-stakes accountability contexts may be constrained by institutional expectations, while deep engagement with communities may surface ethical conflicts that challenge teachers' sense of responsibility. CARE does not resolve these tensions but provides a framework for navigating them. The framework enables teachers to interpret and respond to complexity without collapsing into rigidity or disengagement by holding compassion, accountability, reflection, and engagement in dynamic relation. It is through the dynamic interaction of these four dimensions that leadership development occurs. Wellbeing is embedded within this interaction: as teachers cultivate compassionate and reflective responsiveness, they simultaneously develop the emotional resources necessary to sustain their work. In this sense, wellbeing emerges through the enactment of care-informed leadership practices.

Service-Learning as CARE in Action

This study examines how the CARE framework shaped service-learning projects designed and implemented by four pre-service teachers placed in general and Dual Language Immersion (DLI) classrooms at the elementary level. Service-Learning is an educational approach that is grounded in experiential learning and relies on practices of community development as instructional strategy to meet learning goals (National Youth Leadership Council). Experiential learning is defined by Kolb (1984) as "the process whereby knowledge is created through the transformation of experience" (p. 38). In other words, when students engage with concrete experiences and reflect on them, they will be able to use abstract conceptualization to apply newly created knowledge to new experiences. DLI programs deliver half the school day in English and half in a target language—Spanish, French, or Korean. In the process of designing their service-learning projects, students first identified a classroom need through observation, surveys, and informal interviews, then researched the topic, set goals, designed and implemented a project that addressed the need, collected data, and reflected on outcomes. Throughout, they collaborated with mentor teachers, school counselors, administrators, and families. Most service-learning projects centered on two themes: social and emotional learning and family engagement—both areas of documented need in placement schools. Analyzing these projects through the CARE framework reveals how pre-service teachers enacted its dimensions in practice and how leadership identity developed through that enactment.

Peace Pact—Alina, 2nd Grade

Alina noticed students struggled with conflict resolution. She designed a peer-to-peer Peace Pact protocol: two squares taped on the floor, a talking piece, and explicit steps for active listening, naming feelings, offering solutions, and ending with a compliment. She taught it explicitly through modeling and a PowerPoint before implementation. Students reported enjoying the protocol, using kinder language, and allowing peers more thinking time; seven students noted observing classmates talking over each other less frequently. Through CARE: Alina's interpretation of conflict as communication rather than defiance interprets compassion as a leadership stance. Her acknowledgment that the Peace Pact would have been more impactful had it been implemented from the beginning of the year reflects accountability and reflection working together. Collaborating with students to develop shared language for conflict represents engagement as relational co-creation.

Restorative Circles—Jordan, Kindergarten

Jordan implemented themed restorative circles during morning meeting focused on emotional vocabulary, honesty, and conflict resolution. She used a talking stick, collaborated with the school counselor and vice principal, and held impromptu restorative chats when conflicts arose during the day. Assessment through anecdotal notes showed students completing tasks with fewer meltdowns, engaging more positively with peers, and resolving conflicts more independently. Through CARE: Jordan's consistent practice illustrates the interdependence of compassion and accountability—relational safety made possible by sustained, structured commitment. Her reflection that consistency was key to building the trust that made students willing to share deepened her understanding of leadership as a relational, long-term practice rather than an event.

Family Book Club—Alexandra, DLI Classroom

Alexandra identified that students needed more reading exposure at home and that families needed strategies to support comprehension. She ran three weekly workshops for parents, taught five reading strategies through an anchor chart, sent bilingual materials home in Spanish and English, and had students read chapters with parents between sessions. Results included improved reading assessment scores and increased student confidence and participation in class discussions. Through CARE: Alexandra's project exemplifies engagement as CARE defines it as reciprocal partnership rather than a form of transactional involvement. Her collaboration with her mentor teacher on text selection deepened her responsiveness to the specific literacy needs of the community. The experience of working as a genuine partner with families expanded her professional purpose—an instance of wellbeing emerging through care-informed leadership, not as a separate outcome.

MATH Club—Miriam, 1st Grade Dual Language Immersion

Miriam identified through parent-teacher conferences that non-English-proficient families struggled to support math learning at home due to language barriers and unfamiliarity with U.S. curriculum. She developed bilingual weekly anchor charts, take-home activity packets focused on fractions, and participation contracts. Seven families engaged; results showed stronger parent involvement and improved student performance in small-group math work. Through CARE: Miriam's project demonstrates accountability extended beyond the classroom. Her responsiveness to linguistic and cultural barriers in the home environment reflects an ethical commitment to equity that is relational and grounded in supporting the community. Her reflection on how family conversations reshaped how she designed materials illustrates how engagement and reflection reinforce one another, and how leadership identity deepens through community responsiveness.

Discussion

The most significant finding across these four projects is what happened to the student teachers themselves. Through service-learning, they moved from understanding leadership as a role to experiencing it as a practice—something that they have built through relationships, collaboration, and reflection rather than authority. They learned that knowing students: their struggles, their strengths, their home context is foundational to good teaching. They came to understand that SEL is not a supplement to instruction but integral to it, and that daily improvements in a student's mood and engagement are as significant as any formal assessment measure. They also developed confidence in working with adults, for example mentor teachers, counselors, administrators, and families who became genuine collaborators. Miriam's conversations with families revealed linguistic and cultural barriers that reshaped how she designed materials. Alexandra's collaboration with her mentor teacher on text selection deepened her understanding of responsive instruction. Jordan's conversations with a peer about restorative practices affirmed the value of professional community. Student teachers also noted constraints honestly: time limitations, the trust that SEL work requires, and the complexity of gathering reliable data in real classrooms. These acknowledgments are themselves evidence of CARE as student reflect deeply on what worked and what did not. Instead of self-congratulation these reflections become honest assessments of the conditions of practice. Within these conditions, CARE does not promise the elimination of complexity but a framework to work with that complexity with integrity.

Implications for Teacher Education

If leadership and wellbeing are understood as interdependent and relational, then teacher education must intentionally design experiences that cultivate these dimensions in integrated ways. The CARE framework offers a conceptual structure to rethink how leadership is introduced, practiced, and sustained within teacher preparation. Teacher education programs often treat leadership as an advanced role associated with formal titles or administrative functions. CARE invites a reconceptualization of leadership as relational practice—grounded in compassion, ethical accountability, reflective awareness, and reciprocal engagement—that begins in preservice preparation. The CARE framework positions reflection as a continuous practice central to professional formation. Teacher education programs might consider how reflective inquiry is scaffolded across coursework and field experiences. Rather than functioning as a culminating task, reflective practice could serve as an ongoing space where leadership identity, ethical reasoning, and wellbeing are shaped together. CARE also suggests that teacher preparation should not separate emotional attunement from professional responsibility. Preparing teachers to hold compassion and accountability in tension requires pedagogical spaces where candidates can examine ethical dilemmas, navigate those complexities with courage, and practice adaptive decision-making. CARE emphasizes engagement as reciprocal and community-based. Teacher education programs may consider how candidates are positioned in relationship to families, communities, and colleagues—not only as implementers of curriculum but as collaborative partners who engage in change together. Service-learning, as the projects described here, is a particularly rich site for this work, as it demands the accountability, attentiveness, and community responsiveness that CARE describes. At the same time, implementing CARE within contemporary educational contexts has constraints. Teachers operate within systems shaped by standardization, accountability mandates, and uneven resource distribution, which may limit the extent to which relational and care-centered practices can be sustained. The emotional labor associated with compassion and engagement may place additional demands on educators, particularly in under-resourced environments. Recognizing these tensions is important: CARE is not an idealized solution but a framework that must be negotiated within broader structural conditions.

Conclusion

This paper has presented CARE as a way to reframe teacher leadership as care-informed action grounded in compassion, accountability, reflection, and engagement. Empirically, this framework is grounded in the service-learning projects of four pre-service teachers. The CARE framework offers teacher education a coherent and integrative model that cultivates leadership and wellbeing as mutually reinforcing dimensions of professional preparation. It repositions teacher leadership not as an advanced credential or administrative aspiration, but as a developmental orientation that begins in preservice preparation and deepens across a professional lifetime. The projects described here—a Peace Pact in second grade, restorative circles in kindergarten, a family book club, a bilingual math program—are small in scale. But the leadership dispositions cultivated through them are not. That is the argument this paper makes, grounded in CARE: that consequential, community-engaged action is not a supplement to teacher preparation, but it is a foundation. In other words, CARE is less a destination and an outcome rather than an ongoing practice that becomes more nuanced and more sustaining with practice and continuous integration.

References

Danielson, C. (2006). *Teacher leadership that strengthens professional practice*. Association for Supervision and Curriculum Development.

Day, C., & Gu, Q. (2010). *The new lives of teachers*. Routledge.

Grogan, M., & Shakeshaft, C. (2011). *Women and educational leadership*. Jossey-Bass.

Hargreaves, A., & Fullan, M. (2012). *Professional capital: Transforming teaching in every school*. Teachers College Press.

Katzenmeyer, M., & Moller, G. (2009). *Awakening the sleeping giant: Helping teachers develop as leaders* (3rd ed.). Corwin.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.

Muijs, D., & Harris, A. (2003). Teacher leadership—Improvement through empowerment? An overview of the literature. *Educational Management & Administration, 31*(4), 437–448. https://doi.org/10.1177/0263211X030314007

Noddings, N. (2013). *Caring: A relational approach to ethics and moral education* (2nd ed.). University of California Press. (Original work published 1984)

Spillane, J. P. (2006). *Distributed leadership*. Jossey-Bass.

Varga-Dobai, K. (2024). Writing for wellness: Storytelling, care, and reflection in teacher education. *Literacy, 58*(1), 3–12. http://doi.org/10.1111/lit.12316

Varga-Dobai, K. (2026). *Cultivating care, wellbeing, and reflection in teacher education: Stories that teach*. Routledge.

York-Barr, J., & Duke, K. (2004). What do we know about teacher leadership? Findings from two decades of scholarship. *Review of Educational Research, 74*(3), 255–316. https://doi.org/10.3102/00346543074003255

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Building Global Citizenship Through Language: The Role of Algerian EFL Communities in Shaping Social Justice, Cultural Exchange, and Educational Equity

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Abstract

In an era of intensified globalization and interconnected social challenges, the role of language education in fostering global citizenship has become a critical area of inquiry. This paper explores how Algerian English as a Foreign Language (EFL) communities function as transformative sites for the development of global citizenship values, with a particular focus on social justice, cultural exchange, and educational equity. Situated within a postcolonial, multilingual context traditionally dominated by Arabic and French, English in Algeria is increasingly positioned as a strategic, neutral tool for global engagement. Through a qualitative study involving 36 students and 8 instructors across Algerian higher education institutions, this research examines how EFL pedagogies informed by critical pedagogy, intercultural competence, and sociocultural learning theories can empower learners. Findings reveal that EFL classrooms and extracurricular communities serve as vital spaces for developing critical awareness of social inequalities, facilitating empathetic intercultural dialogue, and cultivating civic agency. Students leverage English as a medium to connect with global networks, advocate for local issues, and negotiate complex identities. However, these promising developments are tempered by significant structural challenges, including resource disparities, rigid curricula, and societal skepticism. The paper concludes that Algerian EFL communities hold significant potential for incubating informed, engaged global citizens. It argues for a deliberate pedagogical shift towards community-focused, justice-oriented curricula, enhanced support for learner-driven initiatives, and sustained institutional and professional development to fully realize this transformative potential within the Algerian educational landscape and beyond.

Keywords: global citizenship education, EFL, Algeria, critical pedagogy, intercultural competence, social justice, higher education

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Introduction: Language Learning in a Globalized World

The 21st century is characterized by unprecedented global flows of people, information, and capital, alongside persistent and complex challenges such as climate change, economic inequality, political instability, and cultural polarization. In this context, the concept of global citizenship has moved from a philosophical ideal to an educational imperative (UNESCO, 2015). Global Citizenship Education (GCED) aims to equip learners of all ages with the values, knowledge, and skills necessary to contribute to a more inclusive, just, and sustainable world. It fosters a sense of belonging to a common humanity, emphasizing interdependence, empathy, solidarity, and respect for diversity.

Within this framework, language education is uniquely positioned. Language is not merely a system of communication but a profound site of identity formation, cultural representation, and power negotiation (Norton, 2013). Consequently, the teaching and learning of foreign languages, particularly global lingua francas like English, present a crucial nexus for GCED. English as a Foreign Language (EFL) pedagogy, when consciously framed, can transcend instrumental goals of grammatical accuracy and lexical range to become a platform for critical global engagement (Byram, 2008; Porto, 2014).

This study investigates this potential within the distinctive context of Algeria, a nation with a rich and complex sociolinguistic tapestry. As a postcolonial society, Algeria's official languages are Modern Standard Arabic and Tamazight, while French remains deeply entrenched in administration, media, and higher education as a legacy of colonial rule. However, the global ascendancy of English is increasingly felt. English is perceived by many Algerians—particularly the youth—as a language of modernity, scientific and technological advancement, and international opportunity, often viewed as more "neutral" than French in the postcolonial psyche (Benrabah, 2013). Its role in Algerian higher education is expanding, signaling a strategic pivot towards broader global networks beyond the Francosphere.

This research posits that Algerian EFL communities—comprising formal classrooms, university clubs, online forums, and project groups—are emerging as significant, yet under-explored, incubators for global citizenship. These spaces provide a unique milieu where Algerian learners can engage with global discourses, reflect on local realities through a critical lens, and develop agency as ethical actors. Grounded in the principles of critical pedagogy (Freire, 2000), intercultural competence (Byram, 1997), and sociocultural learning (Vygotsky, 1978), this paper addresses two central research questions:

1. How do Algerian EFL communities foster intercultural dialogue and social justice awareness among learners?
2. How does participation in these EFL communities contribute to learners' civic engagement and identity formation?

Through an analysis of qualitative data, this paper argues that Algerian EFL education, when leveraged intentionally, can powerfully contribute to shaping socially conscious, interculturally competent, and civically engaged global citizens, thereby promoting greater educational equity and social justice.

Theoretical Framework: Conceptualizing Language, Learning, and Citizenship

Three interconnected theoretical pillars that illuminate the relationship between language learning and global citizenship development frame this study. Paulo Freire's critical pedagogy

provides the ethical imperative for justice-oriented education. Michael Byram's intercultural communicative competence outlines the necessary skills and attitudes for global engagement. Finally, Lev Vygotsky's sociocultural theory explains how these capacities are co-constructed within learning communities. Together, they offer a robust foundation for analyzing Algerian EFL spaces as sites of transformative learning.

Critical Pedagogy and the Politics of Language Education

Paulo Freire's (2000) critical pedagogy provides the foundational ethical and political orientation for this research. Freire critiqued the "banking model" of education, where students are passive recipients of depository knowledge. In contrast, he advocated for a problem-posing education that centers dialogue, critical consciousness (*conscientização*), and praxis—the cycle of reflection and action upon the world to transform it. Applied to EFL, a critical pedagogy approach moves beyond teaching English as a neutral tool. It encourages teachers and learners to interrogate the geopolitical power of English, question representations in texts and media, and explore how language is intertwined with issues of race, class, gender, and colonialism (Crookes, 2013; Pennycook, 2001). In the Algerian context, this involves examining the historical tensions between Arabic, French, and English, and using English as a space to critically analyze both global and local structures of inequality.

This framework is particularly resonant in postcolonial Algeria, where language is inseparable from identity, power, and memory. A Freirean approach in Algerian EFL classrooms challenges learners not only to acquire linguistic competence but also to decode the ideological dimensions of language. Students are invited to question: Who speaks English, and why? How does English interact with—or challenge—the dominance of French and the policies of Arabization? Through dialogue and critical literacy, learners can deconstruct narratives in textbooks, media, and digital content, linking language use to broader social justice themes such as educational access, gender equity, and cultural representation. Thus, English becomes a medium not merely for communication, but for *conscientização*—awakening a critical awareness that fuels informed civic engagement and transformative action within Algerian society and beyond.

Intercultural Competence: Beyond Linguistic Fluency

Michael Byram's (1997) model of intercultural communicative competence (ICC) is essential for understanding the "citizenship" dimension of language learning. Byram argues that effective communication across cultures requires more than linguistic skill (*savoir*). It necessitates a set of intercultural attitudes (*savoir être*), knowledge (*savoirs*), skills of interpreting and relating (*savoir comprendre*), skills of discovery and interaction (*savoir apprendre/faire*), and critical cultural awareness (*savoir s'engager*). This last element, critical cultural awareness, is the cornerstone of global citizenship within language education. It is the ability to evaluate, critically and on the basis of explicit criteria, perspectives, practices, and products in one's own and other cultures (Byram, 2008).

For Algerian EFL learners, developing ICC means using English not only to describe cultural differences, but to engage with them empathetically, ethically, and critically—challenging stereotypes while building relational understanding. In practice, this translates to classroom and extracurricular activities that foster *savoir être* (openness and curiosity toward other cultures), *savoir comprendre* (interpreting events from multiple cultural perspectives), and *savoir s'engager* (critically reflecting on one's own and others' cultural assumptions). Through

structured exchanges, collaborative projects, and reflective discussions, learners move beyond superficial cultural comparisons to meaningful intercultural dialogue. This competency enables them to navigate Algeria's multilingual, postcolonial identity while participating confidently and critically in global conversations, embodying the role of informed and empathetic global citizens.

Sociocultural Learning: Community as a Catalyst

Lev Vygotsky's (1978) sociocultural theory posits that learning is fundamentally a social process, mediated by tools like language and situated within a cultural and historical context. Learning occurs in the "Zone of Proximal Development" through interaction with more knowledgeable others. This perspective shifts the focus from the individual learner to the learning community. Algerian EFL communities—whether a classroom, a debate club, or a digital exchange—are such sociocultural sites. They are "communities of practice" (Lave & Wenger, 1991) where learners, through legitimate peripheral participation, gradually adopt the practices, discourses, and identities of more globally-oriented, critically-engaged individuals.

Within these communities, English functions as both the object of learning and the primary mediating tool for socialization into new ways of thinking and being. As students collaborate on projects, engage in dialogue, and negotiate meaning with peers and instructors, they internalize not only vocabulary and grammar but also the values and dispositions associated with global citizenship—such as critical inquiry, empathy, and collaborative problem-solving. The community provides a scaffolded environment where learners can safely experiment with new identities, from hesitant speaker to confident debater, or from local student to intercultural mediator. Thus, learning English becomes profoundly intertwined with learning to *be* a certain kind of person: an active questioner, a cooperative collaborator, and an ethical global interlocutor.

Together, these theories form an integrated lens. Critical pedagogy provides the *why*—the justice-oriented purpose. Intercultural competence outlines the *what*—the necessary knowledge, skills, and attitudes. Sociocultural learning explains the *how*—the process through which these are developed within collaborative communities.

Context and Methodology

To ground this theoretical inquiry, the study is situated within Algeria's complex sociolinguistic reality and employs a qualitative methodology designed to capture the lived experiences of learners and educators within EFL communities.

The Algerian Sociolinguistic and Educational Landscape

Algeria's linguistic landscape is a living archive of its history. The legacy of 132 years of French colonization left French deeply embedded in key sectors such as administration, media, and higher education, creating a durable linguistic duality with Arabic. The post-independence Arabization policy sought to re-establish Arabic as the primary language of national identity and formal education, leading to complex social and generational tensions (Benrabah, 2013). In recent decades, English has entered this dynamic field as a significant third force. It is taught as a compulsory subject from middle school and constitutes a major discipline in universities. For many students, English represents a strategic escape from the Franco-Arabic binary—a language of global research, digital connectivity, pop culture, and diplomacy, widely perceived

as offering more neutral and equitable access to international academic and professional networks (Miliani, 2000).

Within higher education, EFL departments are thus sites of unique potential. They attract students who are, by definition, oriented toward global engagement. However, traditional teaching methods often remain heavily exam-centric, emphasizing grammar-translation and literary analysis over communicative fluency, critical thinking, or intercultural pedagogy. This creates a paradoxical space: classrooms full of globally curious learners are frequently subjected to pedagogies that look inward rather than outward. Consequently, this study intentionally focuses on the emergent pockets of innovation within this system—where instructors and learners collaboratively explore alternative, participatory, and critically-engaged approaches to English language education.

Research Design and Methods

This study employed a qualitative, interpretive research design to gain an in-depth, nuanced understanding of the experiences and perceptions of participants within Algerian EFL communities (Creswell & Poth, 2018). The research was conducted over an 18-month period across three public universities in Algeria.

Participants

The study involved 36 undergraduate EFL students (aged 19–24) and 8 EFL instructors. Participants were recruited through purposive sampling to include individuals actively engaged in both formal coursework and extracurricular EFL activities (e.g., English clubs, online exchange projects, volunteer translation groups).

Data Collection

A multi-method approach was used to ensure triangulation:

1. *Semi-structured Interviews:* In-depth interviews (45–70 minutes each) were conducted with all 8 instructors and 18 focal students. Interviews explored perceptions of global issues, experiences with intercultural exchange, views on the role of English in Algerian society, and narratives of personal or civic action taken through English.
2. *Participant Observation:* Over 120 hours of observation were conducted in various settings: university EFL classrooms, English club meetings, and public events organized by EFL students (e.g., charity fundraisers with English themes, cultural celebration days).
3. *Document Analysis:* Student-produced materials were analyzed, including reflective journals (submitted voluntarily), project reports, social media posts from English-language club pages, and materials from student-led campaigns.
4. *Focus Groups:* Four focus groups with 4–5 students each were held to stimulate discussion on specific themes like “English and Social Media Activism” and “Representing Algeria in International Exchanges.”

Data Analysis

All interview and focus group recordings were transcribed verbatim. Thematic analysis (Braun & Clarke, 2006) was employed. This involved an iterative process of familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming

themes, and producing the final analysis. The theoretical framework informed the coding process, but themes were also allowed to emerge inductively from the data. Key themes identified included: "English as a Safe Space," "Navigating Linguistic Identity," "From Awareness to Action," "Digital Bridges," and "Structural Friction."

Findings and Discussion

The analysis revealed that Algerian EFL communities function as multifaceted spaces where global citizenship is actively negotiated, practiced, and performed. The findings are organized around three core, interrelated dimensions: Critical Awareness, Intercultural Dialogue, and Civic Agency.

Fostering Critical Awareness: English as a "Safe Space" for Reflection

A prominent finding was that the EFL classroom, particularly when guided by a critically-minded instructor, was often described by students as a "safe space" or a "different world" compared to other academic settings.

Here, English served as a mediating tool that created critical distance from their immediate sociolinguistic realities, allowing for frank discussion of sensitive topics.

Reflecting on Social Inequalities

Students used English to analyze and discuss issues often considered taboo or polarized in mainstream Arabic or French media discourses. For example, in journal entries and class discussions, students critically examined gender roles in Algeria, compared them with representations in global media, and debated concepts of equality. One student wrote in her journal: *"In our English debate on women in STEM, I felt I could argue for more opportunity without it becoming a 'Western vs. Algerian values' fight. The language itself gave us a new framework."* Similarly, issues of economic disparity, access to education in rural areas, and environmental degradation were explored through project-based learning, where students researched global statistics and connected them to local case studies.

Deconstructing Linguistic Hierarchies

The act of learning English itself prompted critical reflection on Algeria's linguistic landscape. Students articulated an awareness of the symbolic power of French and the political history of Arabization. Many saw English as a strategic tool for "bypassing" these historical tensions. As one instructor noted: *"They tell me, 'French is the language of the past, Arabic is the language of the state, but English is the language of my future.' They see it as an equalizer."* This perception, while potentially overlooking the neo-colonial dimensions of global English, demonstrates learners' active negotiation of their multilingual identities and their desire for a tool perceived as more democratically accessible on the global stage.

Developing Critical Thinking Dispositions

Through analyzing diverse texts—from news articles on refugee crises to speeches by global activists—students practiced evaluating sources, identifying bias, and constructing evidence-based arguments in English. This process developed what Byram calls *savoir s'engager*

(critical cultural awareness). They were not just learning *about* the world in English; they were learning to *critique* it.

Table 1
Feedback on Developing Critical Awareness in EFL Spaces

Theme	Participant Category	Representative Feedback / Data Excerpt	Implied Pedagogical Value
English as a Mediating Tool for Sensitive Topics	Student (Female, Year 3)	*"Discussing gender roles in English class feels less charged. In Arabic or French, it's immediately about 'our traditions' vs. 'the West.' In English, we can analyze global data and then ask, 'What does this mean for us here?' It creates a buffer for rational debate."*	Creates a discursive "third space" for critical reflection detached from emotionally laden linguistic hierarchies.
Deconstructing Linguistic Power	Instructor (10+ years experience)	*"In their essays, students explicitly contrast the 'colonial baggage' of French with the 'strategic neutrality' of English. One wrote: 'French is a locked door to the past. English is a key to many future doors.' They are actively mapping language onto power and opportunity."*	EFL prompts meta-linguistic awareness and a critical analysis of Algeria's sociolinguistic landscape.
From Passive Reception to Critical Evaluation	Student (Male, Year 4)	*"Our teacher gives us two news articles on the same event—one from Al Jazeera English, one from BBC. Our task isn't to translate, but to ask: 'Who is the audience? What is emphasized? What is omitted?' This skill now changes how I read everything."*	Develops critical media literacy and source evaluation skills (*savoir s'engager*).
Linking Global Issues to Local Realities	Document Analysis (Group Project Report)	**Project Title:** *"Water Scarcity: From Cape Town to Ghardaïa."* **Excerpt:** *"The 'Day Zero' framework used in South Africa helped us understand and communicate the urgency of our own local water stress to our community in a new way."*	

Facilitating Intercultural Dialogue: Building Empathetic Bridges

EFL communities provided both structured and organic opportunities for meaningful intercultural contact, moving learners beyond superficial cultural comparison toward deeper relational exchange and the development of Byram's *savoir être* (intercultural attitudes).

Structured Exchanges and Clubs

University English clubs served as vital hubs for this dialogue. They organized carefully planned thematic video-conference exchanges with peers in countries such as Turkey, South Korea, and Canada. These sessions focused on shared global challenges like youth unemployment or climate action, transforming language practice into empathetic dialogue. As one observation note recorded, discussions often revealed profound commonalities, such as when Algerian and Korean students bonded over shared societal pressures regarding academic achievement, demonstrating moments of cross-cultural recognition and solidarity.

Culture as Dynamic and Relational

Through sustained interaction, students' conceptualizations of culture evolved significantly. Initial engagements often relied on static, symbolic representations (e.g., food, traditional dress). However, prolonged dialogue fostered an understanding of culture as fluid and lived. Students began to discuss hybrid identities, generational shifts, and internal diversity, reflecting a move from cultural essentialism to a nuanced, relational perspective. One student's reflection encapsulates this shift: recognizing that culture encompasses both global pop culture consumption and local familial traditions as interconnected parts of a dynamic identity.

Digital Platforms as Intercultural Arenas

Participants actively extended this dialogue into digital spaces, using social media and language-exchange apps to engage with global discourses. This digital engagement often involved proactive cultural representation, such as students challenging stereotypes about Algeria by sharing verified content about the nation's achievements. One student described an act of "digital diplomacy" on a Reddit forum, using English not merely to contradict misinformation but to constructively educate others by citing examples of Algerian female professionals. This practice illustrates the development of critical cultural awareness (*savoir s'engager*) and ethical communication skills in global digital publics.

Table 2
Feedback on Experiencing Intercultural Dialogue Through EFL

Theme	Participant Category	Representative Feedback / Data Excerpt	Implied Competency Development
Moving Beyond Cultural Stereotypes	Student (Female, Year 2, English Club Member)	*"Before our Zoom exchange with Seoul, I expected rigid formality. We bonded over K-dramas and shared stress about university exams. We sent each other meme playlists. It shattered my monolithic idea of 'Korean culture.'"*	Fosters *savoir apprendre/faire* (skills of discovery and interaction) and challenges essentialist views.
Culture as Dynamic and Lived	Focus Group Participant	*"We used to do 'Culture Day' with food and flags. Now our club runs 'Issue Day.' We partner with a university in Kenya to discuss 'Youth Unemployment Solutions.' Culture isn't just what we eat; it's the problems we face and how we try to solve them together."*	Advances understanding of culture as a dynamic, practiced, and contested process rather than a static product.
Digital Platforms for Agency & Representation	Observation Note / Student Social Media Post	**Observed Action:** Student correcting a misrepresentation about Algerian women on an international forum. **Posted Text Excerpt:** *"As an Algerian woman studying computer science, I can tell you the narrative is more complex. Here are profiles of three leading Algerian tech entrepreneurs..."*	Develops skills for ethical digital engagement and active, respectful representation of one's own community (*savoir être*).
Empathy through Shared Vulnerability	Interview with Instructor	*"The most powerful moment was when a student shared her family's experience with economic hardship during an exchange with Turkish peers. A Turkish student then shared a similar story. They weren't just practicing past tenses; they were connecting through shared human vulnerability in a new language."*	

Cultivating Civic Agency: From Learners to Actors

The most compelling evidence of global citizenship formation was the translation of critical awareness and intercultural dialogue into concrete civic action. Learners began to strategically employ their English skills not merely for personal advancement, but as a practical tool for advocacy and community improvement, embodying the Freirean cycle of praxis.

Applied English for Social Action

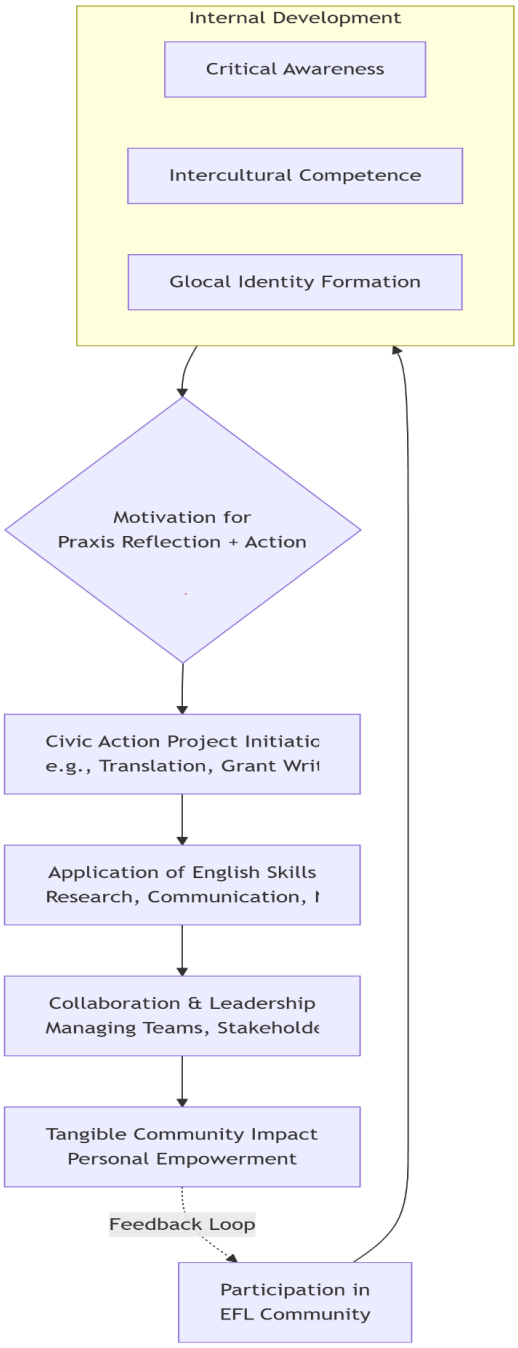
This agency manifested in student-initiated projects that directly addressed local needs by leveraging English as a key resource. Documented examples included a group that translated public health information on diabetes prevention from the World Health Organization's English materials into clear Algerian Darija dialect for a local clinic, bridging a critical information gap. Another student cohort successfully used English to research, write, and secure a small international grant to fund a library project in an underserved village. Further, the creation of a bilingual blog and social media channel, "Algeria Unveiled," served to document cultural heritage sites for both domestic and international audiences, promoting preservation and tourism. These initiatives moved learning beyond hypothetical classroom tasks into the realm of tangible social contribution.

Leadership and Collaborative Skill Development

Organizing such projects required and simultaneously fostered essential global citizenship competencies. Students navigated collaboration across diverse team dynamics, managed timelines and resources, and learned to communicate effectively with a range of stakeholders—from local community leaders to international NGO representatives. This process cultivated practical leadership. As one instructor noted, witnessing a once-timid student evolve into a confident project coordinator demonstrated that the core outcome extended far beyond linguistic accuracy to encompass personal empowerment and civic capability.

This flowchart illustrates the sequential and interconnected process through which learners in Algerian EFL communities develop and enact civic agency, moving from individual awareness to collective action.

Figure 1
The Process of Developing Civic Agency



Negotiating a Glocal Identity

Through this active engagement, students constructed what can be termed a "glocal" identity (Robertson, 1995). They came to perceive themselves as Algerian actors on a global stage, adept at using transnational tools—such as the English language and digital networks—to understand, reframe, and address local concerns. Their sense of civic identity thus expanded; it was no longer bounded solely by the nation-state but was reconfigured through a sense of responsibility that was simultaneously locally grounded and globally informed. This fusion of the global and the local within their self-concept represents a fundamental shift from being

learners of English to becoming active, ethically-oriented citizens who use language as an instrument for meaningful participation in interconnected communities.

Table 3
Feedback on Translating Learning Into Civic Agency

Theme / Project Type	Participant Role	Description of Action & Feedback	Developed Skills & Impact
Community Health Translation Project	Student Project Leader	**Action:** Translated diabetes prevention guides from WHO (English) into clear Algerian Darija dialect for a local clinic. **Feedback:** *"The doctors were so grateful. They said many patients did not understand the formal Arabic materials from the ministry. We used our English skills to access the science and our local language to make it actually useful."*	**Skills:** Collaborative translation, community needs assessment, intercultural mediation. **Impact:** Improved accessible public health communication.
Bilingual Cultural Heritage Blog	Student Founder	**Action:** Created "Algeria Unveiled," a blog/social media channel documenting historical sites in English & Arabic. **Feedback:** *"It started for a class project. Now we have followers from other countries asking about visiting. One local tourism office asked to use our photos. We're becoming curators of our own heritage for a global audience."*	**Skills:** Digital content creation, cultural representation, digital citizenship, entrepreneurship. **Impact:** Promotes cultural preservation and positive national image.
Leadership Transformation	Instructor Observation	**Observed Change:** *"I have a student, Yacine, who was painfully shy. He joined the club's 'City Clean-Up' campaign and was tasked with writing the English press release. He did it well. Now he's coordinating volunteers and liaising with the city council. His English is the tool, but his confidence and leadership are what truly flourished."*	**Skills:** Public communication, stakeholder engagement, team management, leadership. **Impact:** Personal empowerment and the development of actionable civic leadership qualities.

Challenges and Structural Constraints

Despite the promising developments documented, the integration of global citizenship within Algerian EFL education confronts significant systemic obstacles that threaten its sustainability and equitable implementation.

Resource and Access Disparities

A pronounced digital divide and stark infrastructural inequalities between urban and rural institutions severely restrict opportunities for many students. Limited access to reliable internet or the financial means to participate in club activities excludes a significant portion of the student body from the very exchanges and projects that foster global engagement. This exclusion risks replicating and reinforcing social hierarchies within educational spaces, thereby undermining the core principles of equity and inclusion that global citizenship education aims to advance.

Rigid, Exam-Oriented Curricula

The prevailing university curriculum and national assessment systems remain overwhelmingly focused on grammatical precision and literary analysis, sidelining communicative competence and critical engagement. Instructors who endeavor to implement project-based or critical pedagogies are often forced to operate on the margins, treating such work as extracurricular supplements. This lack of formal curricular validation and assessment weighting creates a structural inertia that systematically marginalizes transformative educational approaches, limiting their reach and impact.

Societal and Institutional Skepticism

Persistent skepticism permeates both educational institutions and broader Algerian society regarding the role of English and the values embedded within Global Citizenship Education (GCED). Critics often frame GCED as a distraction from core linguistic study or, more pointedly, as a conduit for Western cultural imperialism. This underlying suspicion erodes institutional support, constrains funding, and challenges the legitimacy of programs designed to foster critical global awareness, thereby stifling innovation.

Need for Teacher Development

Successfully enacting a critical, intercultural GCED framework demands a substantial pedagogical shift for which many educators are underprepared. Trained predominantly in traditional, transmission-oriented methods, teachers frequently report a pressing need for dedicated professional development. This training must equip them with the skills to facilitate complex dialogues on social issues, design and scaffold community-engaged projects, and develop meaningful assessments for competencies like intercultural sensitivity and civic agency—skills not measured by conventional language tests. Without this support, the transformative potential of EFL as a site for global citizenship remains unrealized.

Conclusion and Implications

This study demonstrates that Algerian EFL communities are potent, dynamic spaces where the ideals of global citizenship are being actively—if sometimes imperfectly—lived and learned. Through the mediating tool of English, students are developing critical awareness of local and global justice issues, engaging in empathetic and transformative intercultural dialogue, and translating their learning into meaningful civic agency. They are constructing resilient, glocal identities that allow them to navigate Algeria's complex postcolonial reality while claiming a voice on the global stage.

However, realizing the full potential of this transformation requires moving beyond isolated pockets of excellence to systemic integration. The challenges are substantial but not insurmountable. They call for a coordinated effort across multiple levels:

Pedagogical Implications

Curriculum Innovation

EFL curricula at the national and institutional levels should explicitly integrate GCED principles. This involves moving from a content-based syllabus to a competency-based framework that values critical cultural awareness, ethical communication, and civic action as core learning outcomes alongside linguistic proficiency.

Community-Focused Learning

Pedagogy should emphasize project-based, community-engaged learning. Language tasks can be designed around real-world issues (environmental clean-ups, public awareness campaigns, cultural documentation), requiring students to use English for research, collaboration, and advocacy.

Assessment Reform

Assessment strategies must evolve to evaluate intercultural competence, critical reflection, and collaborative project work, not just discrete grammatical knowledge.

Institutional and Policy Implications

Support for Extracurricular Hubs

Universities should provide sustained logistical and financial support for EFL clubs, conversation groups, and digital exchange programs, recognizing them as core components of holistic education.

Investment in Teacher Training

Comprehensive, ongoing professional development programs are essential. These should equip teachers with the methodologies of critical pedagogy, intercultural teaching, and community-based project facilitation.

Bridging the Digital Divide

Public and institutional policies must prioritize equitable access to reliable internet and digital tools for all students to prevent the exacerbation of existing inequalities.

Future Research Directions

Future studies could longitudinally track the civic and professional trajectories of students engaged in such EFL communities. Comparative research with other postcolonial multilingual contexts (e.g., Morocco, Tunisia, Lebanon) would enrich the understanding of how global citizenship is negotiated through language in similar yet distinct settings. Furthermore, research

exploring the development of teaching materials that locally contextualize global citizenship themes for the Algerian classroom is urgently needed.

In conclusion, English language education in Algeria stands at a crossroads. It can remain a conventional academic subject, or it can embrace its transformative potential as a catalyst for building a generation of critically-minded, interculturally adept, and civically-engaged global citizens. The voices and actions of the students and teachers in this study point clearly towards the latter, more promising path—one that aligns language learning with the urgent project of creating a more just, equitable, and interconnected world.

References

Benrabah, M. (2013). *Language conflict in Algeria: From colonialism to post-independence*. Multilingual Matters.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Byram, M. (1997). *Teaching and assessing intercultural communicative competence*. Multilingual Matters.

Byram, M. (2008). *From foreign language education to education for intercultural citizenship: Essays and reflections*. Multilingual Matters.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage.

Crookes, G. V. (2013). *Critical ELT in action: Foundations, promises, praxis*. Routledge.

Freire, P. (2000). *Pedagogy of the oppressed* (30th anniversary ed.). Continuum.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Miliani, M. (2000). Teaching English in a multilingual context: The Algerian case. *Mediterranean Journal of Educational Studies, 6*(1), 13–29.

Norton, B. (2013). *Identity and language learning: Extending the conversation* (2nd ed.). Multilingual Matters.

Pennycook, A. (2001). *Critical applied linguistics: A critical introduction*. Lawrence Erlbaum Associates.

Porto, M. (2014). Intercultural citizenship education in an EFL online project in Argentina. *Language and Intercultural Communication, 14*(2), 245–261.

Robertson, R. (1995). Glocalization: Time-space and homogeneity-heterogeneity. In M. Featherstone, S. Lash, & R. Robertson (Eds.), *Global modernities* (pp. 25–44). Sage.

UNESCO. (2015). *Global citizenship education: Topics and learning objectives*. UNESCO.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

ICT Engagement and Learning Outcomes Among Lagos State University College of Medicine, Medical Students

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Abstract

The Fourth Industrial Revolution has positioned information and communication technology (ICT) as a central driver of knowledge acquisition in higher education. Grounded in self-determination theory (SDT), this study examines ICT engagement, knowledge acquisition methods, and the effect of ICT engagement on learning outcomes among undergraduates at Lagos State University College of Medicine (LASUCOM) in Nigeria. A cross-sectional online survey using convenience sampling was administered to 509 undergraduates, collecting self-reported data on ICT engagement and perceived learning outcomes, which were analyzed using descriptive statistics in SPSS version 26. The findings revealed high ICT engagement: 94.1% actively used digital devices for academic work, and 89.2% reported confidence in ICT use, consistent with SDT's competence and autonomy dimensions of SDT. Lecture notes, educational websites, and digital databases dominated knowledge acquisition; however, printed textbooks remained relevant, reflecting a hybrid-learning orientation. Over 93% of participants reported perceiving that ICT tools enhance their content comprehension, extend learning beyond the classroom, and foster critical thinking; however, these perceptions were not validated against objective learning outcome measures. The cross-sectional, single-institution design and reliance on self-reported perceptions limit causal inference and generalizability. Institutional strategies should move beyond infrastructure provision to cultivate digital literacy, support self-regulated learning, and redesign curricula that leverage both traditional and digital resources in the 4IR context.

Keywords: information and communication technology (ICT), ICT engagement, knowledge acquisition, undergraduates, 4th industrial revolution (4IR), higher education

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Introduction

Information and communication technology (ICT) is crucial for driving the fourth industrial revolution, which is characterized by the merging of digital, physical, and biological systems. ICT facilitates access to information, communication, collaboration, learning, and innovation across various fields and industries. ICT engagement refers to the frequency and extent of individuals use of ICT tools and resources for various activities, including education, work, entertainment, and social interaction. Engaging with ICT can positively impact knowledge acquisition, which involves obtaining, creating, sharing, and applying knowledge in diverse contexts. This knowledge acquisition process can improve cognitive, emotional, and behavioural outcomes, such as academic achievement, motivation, self-confidence, and career advancement.

University students use digital tools to learn more in today's digital world, especially in academics. Studies (D'Mello, 2021; Hew & Cheung, 2014; Kunina-Habenicht & Goldhammer, 2020) show that digital technology helps students engage by offering active learning, teamwork, feedback, and motivation.

In the 21st century, it is important to know how to use information and communication technology (ICT) well in learning and everyday life. ICT skills are not just about knowing how to use computers and software. They also involve cognitive and social knowledge (Jackman et al., 2021). It is important to encourage mental and motivational factors that help people use ICT independently of others. These factors are called ICT engagement, which was studied in the PISA 2015 (Kunina-Habenicht & Goldhammer, 2020).

The educational application of information and communication technology (ICT) has been extensively examined and debated in both academic and professional literature. ICT can facilitate knowledge acquisition by improving access to information, enabling communication and collaboration, and supporting the development of digital skills and competencies. However, ICT also presents challenges and risks, such as the digital divide, cyberbullying, privacy concerns, and ethical dilemmas.

Students' reliance on technology is evident in various aspects of their educational journey. From utilizing web resources for research to preparing for classes, and employing devices to capture and archive class sessions for future reference, technology has seamlessly integrated into the fabric of their academic pursuits (Alsayed et al., 2021). This shift empowers students to take charge of their learning and fosters independent inquiry and digital literacy, thereby altering the dynamics of teaching and learning in higher education institutions (Akour & Alenezi, 2022; Akram et al., 2022).

This study aimed to assess the level of ICT engagement among undergraduate students at Lagos State University College of Medicine (LASUCOM), identify the primary methods and sources through which they acquire knowledge, and examine the effect of ICT engagement on their knowledge acquisition. As a subset of Lagos State University, LASUCOM is one of the largest and most esteemed public universities in Nigeria, with an enrolment exceeding 3,000. LASUCOM offers a diverse range of academic programs that integrate ICT components, including online courses, e-learning platforms, digital libraries and laboratories.

Despite widespread ICT availability, few studies have applied the PISA 2015 ICT engagement framework to examine knowledge acquisition in Nigerian medical education contexts, where

infrastructure constraints, pedagogical traditions, and student populations may differ from the high-income settings in which the framework was developed. Understanding ICT engagement in this context is essential for evidence-based digital learning policy in Nigeria. Previous research has predominantly focused on the barriers, challenges, and benefits associated with ICT adoption and integration in higher education. However, these studies have not specifically examined the dimensions and outcomes of ICT engagement concerning knowledge acquisition. This exploratory study provides an initial descriptive baseline of ICT engagement and perceived knowledge acquisition at LASUCOM using the SDT-informed ICT engagement framework. While the findings are context-specific and do not test causal hypotheses, they offer preliminary evidence to guide future research and may contribute to digital learning policy discussions at LASUCOM and similar institutions, pending replication and validation with objective outcome measures. This study addresses the following questions:

1. What is the level of ICT engagement among undergraduate students at the Lagos State University College of Medicine?
2. What are the major ways by which undergraduate students of the Lagos State University College of Medicine acquire knowledge relating to their studies?
3. Which knowledge sources do undergraduate students at the Lagos State University College of Medicine report using most frequently and perceiving as most helpful for their studies?
4. How do LASUCOM undergraduate students perceive the effects of ICT engagement on their knowledge acquisition?

Given the exploratory nature of this baseline assessment, formal hypotheses were not specified. However, SDT suggests that students reporting higher perceived ICT competence and autonomy will report greater ICT engagement and more positive perceptions of learning outcomes. Future research should test these predictions using inferential analyses.

Literature Review

The onset of COVID-19 in 2020 and the subsequent global lockdown markedly accelerated the adoption and utilization of digital technology by institutions and individuals for educational and personal purposes (Bagheri-Nesami et al., 2021). Globally, educational institutions have rapidly transitioned to online teaching and learning, with studies documenting this shift in diverse national contexts, including Georgia (Basilaia & Kvavadze, 2020), China (Bao, 2020), and Nigeria (Onyema et al., 2020). Academics have faced significant pedagogical adjustments during sudden campus closures (Czerniewicz et al., 2019; Mishra et al., 2020). Students also reported varied experiences, with engagement levels and learning outcomes shaped by access to devices, connectivity, and institutional support (Wargadinata et al., 2020). The integration of Information and Communication Technology (ICT), encompassing educational technology and digital content, has the potential to enhance educational quality, expand learning opportunities, facilitate effective instruction, and foster student knowledge acquisition (Baradaran Abdollahy et al., 2020). The pervasive influence of ICT has precipitated substantial transformations in various facets of both individual and collective life, ultimately leading to the advent of e-learning (Pokhrel & Chhetri, 2021).

In contemporary higher education, technology has become an indispensable and integral component of modern learning and pedagogy (Haleem et al., 2022). This shift toward technology-enabled education holds significant potential to enhance the learning experiences of undergraduate students. It equips them with a diverse array of tools and resources that facilitate seamless information access, foster collaboration, and create invaluable networking

opportunities (Alshammari & Alanazi 2023). The growing uptake of e-learning platforms such as Moodle and communication tools such as WhatsApp reflects students' pragmatic choices about where to learn and how to engage with course content (Mpungose, 2020). Alongside formal platforms, social media has emerged as a significant supplementary space for academic engagement in higher education, extending participation beyond Facebook to platforms such as Instagram, Pinterest, and text-based tools (Manca, 2020). These trends are not limited to high-income settings; e-learning adoption among university students in developing countries, including Vietnam and Nigeria, demonstrates that digital engagement in higher education is a global phenomenon (Ho et al., 2021). Students' digital competence, which spans technical, informational, and communicative dimensions, varies across disciplines, highlighting the need for targeted institutional support (Burgos-Videla et al., 2021). Engagement with digital resources such as online databases, search engines, and electronic records similarly enhances information accessibility, helping students stay informed about developments in their fields (Alsayed et al., 2021).

ICT engagement encompasses four dimensions: interest in ICT, perceived ICT competence, autonomy in ICT use, and ICT as a topic of social interaction. Interest in ICT refers to an enduring inclination to engage in ICT-related topics, tasks, or activities. Perceived ICT competence is a subjective evaluation of an individual's ability to utilize ICT. Perceived autonomy in ICT use pertains to the sense of volition and choice in employing ICT. ICT as a topic in social interaction denotes the extent to which individuals discuss ICT-related issues with others (Kunina-Habenicht & Goldhammer, 2020). ICT engagement is anticipated to influence both the frequency and quality of ICT use for various purposes, such as entertainment, learning, and communication. Furthermore, ICT engagement may impact academic achievement and other educational outcomes, as well as career choices and lifelong learning opportunities (Kunina-Habenicht & Goldhammer, 2020).

Kunina-Habenicht and Goldhammer (2020) tested this four-dimensional structure using PISA 2015 data from Germany and Switzerland. The scales accounted for the greatest variance in ICT use for entertainment, and girls scored lower than boys on all subscales except for ICT interest.

D'Mello's (2021) OECD study provides valuable insights into effective methodologies for assessing student engagement with digital technologies. It also proposes strategies for designing these technologies to enhance engagement at the onset of learning or during periods of disengagement from the learning process. This chapter emphasizes that digital technologies can facilitate student engagement by offering opportunities for active learning, collaboration and feedback. Hew and Cheung (2014) investigated the influence of internal variables, such as goals, on student motivation in massive open online courses (MOOCs). Their findings indicate that students enroll in MOOCs to acquire knowledge or skills in a specific domain, obtain certification, connect with others interested in the topic, and advance their educational or career goals.

Fraillon et al. (2020) employ the term "engagement" to encompass both behavioural and emotional engagement, as delineated in Timotheou et al.'s (2023) framework on digital technology engagement. Behavioural engagement refers to the manner and frequency with which students utilize ICT, whereas emotional engagement refers to students' attitudes and feelings toward ICT. According to Fraillon et al. (2020), understanding the concept of engagement is crucial for comprehending students' interactions with ICT in educational settings.

Fraillon et al. (2020) delineate students' engagement with information and communication technology (ICT) through two primary perspectives: general ICT utilization and ICT application for academic purposes. The former involves the frequency with which students use ICT tools for activities such as creating or modifying informational content, engaging in social interactions, sharing information, and participating in recreational activities. In contrast, the latter pertains to the use of ICT within the academic domain, encompassing tasks such as completing assignments, conducting research, sourcing information, taking notes, composing projects and research papers, and delivering presentations. Consequently, Fraillon et al. (2020) suggest that a deeper understanding of student engagement can enable educators to design more effective learning experiences that incorporate ICT use, thereby enhancing learning outcomes and academic achievements.

Timotheou et al. (2023) elucidated the transformative impact of digital technology on education, emphasizing the imperative for educational institutions to augment their digital capabilities to foster meaningful ICT engagement among students. The research highlights that the recent COVID-19 pandemic accelerated the integration of digital technology in educational settings, thereby exposing disparities in digital readiness among higher-education institutions and underscoring the complexity of digital integration, which affects student performance and other dimensions of the educational environment.

While prior research (Fraillon et al., 2020; Kunina-Habenicht & Goldhammer, 2020) has validated ICT engagement constructs in high-income countries, their applicability and manifestation in resource-constrained, rapidly digitizing contexts such as Nigerian medical education remain underexplored. This study addresses this gap by documenting ICT engagement patterns and perceived learning effects at LASUCOM, providing preliminary evidence on whether SDT-based engagement dimensions are relevant in this setting and suggesting potential areas for further investigation and intervention development.

Theoretical Framework

This study is grounded in Self-Determination Theory (SDT), developed by Ryan and Deci (2020). As further elaborated by Chiu (2022), SDT explains human motivation, well-being, and personality through the lens of three fundamental needs: autonomy, competence, and relatedness. Autonomy pertains to control over one's behaviors and goals; competence involves the experience of effectiveness and challenge; and relatedness focuses on interpersonal connections. The fulfillment of these needs is associated with enhanced well-being, psychological flourishing, and an elevated quality of life. Ryan and Deci (2020) contested the prevailing notion that external rewards are the primary motivators of behavior. Instead, they posited that individuals are inherently driven to engage in activities that are intrinsically interesting, satisfying, and meaningful, and that intrinsic motivation fosters greater well-being and personal growth.

SDT, which is effectively applied in educational contexts, distinguishes autonomous motivation (driven by volition and choice) from controlled motivation (driven by external pressures). Autonomously motivated individuals tend to show greater interest, vitality, and confidence, which enhances their performance and well-being (Ryan & Deci, 2020).

Self-Determination Theory (SDT) is utilized in the educational domain to understand students' engagement with information and communication technology (ICT) for knowledge acquisition in the context of the Fourth Industrial Revolution. This era is characterized by the convergence

of the physical, digital, and biological domains through technologies such as artificial intelligence, biotechnology, robotics, and nanotechnology. These advancements present novel challenges and opportunities for education, necessitating that students develop new skills, competencies, and mindsets to succeed in an increasingly dynamic environment.

According to SDT, students' engagement with ICT and their acquisition of knowledge depend on how well the learning environment meets these three psychological needs. Students who feel autonomous choose ICT activities that match their interests; those who feel competent take on more challenging tasks and persist through difficulties; and those who feel connected to others collaborate and seek support more readily. Educators can build on this by designing learning environments that support all three needs of the students.

The significance of Self-Determination Theory (SDT) in relation to undergraduates' engagement with Information and Communication Technology (ICT) and their knowledge acquisition during the Fourth Industrial Revolution is rooted in its capacity to elucidate how students' motivation can be enhanced by fulfilling their basic psychological needs. A study introduced a comprehensive theoretical model that integrates SDT, self-efficacy, and the technology acceptance model to elucidate the acceptance of technology-enhanced learning during the COVID-19 pandemic among university students. The findings indicated that the determinants of SDT significantly predicted the constructs of the technology acceptance model, with perceived competence emerging as the most influential factor (Rosli & Saleh, 2022). SDT offers a theoretical framework for understanding how students' motivation can be augmented by satisfying their basic psychological needs. Research on self-determination and student engagement in higher education further confirms that competence beliefs and relatedness are significant predictors of academic engagement (Assefa et al., 2025).

Methodology

This study used a survey design with quantitative data to provide a holistic understanding of the research problems. Quantitative data were collected via an online questionnaire (Google Form) to assess the level of ICT engagement and knowledge acquisition among undergraduate students at the Lagos State University College of Medicine. The study population comprised undergraduate students across all levels within the Faculty of Clinical Sciences at Lagos State University College of Medicine. Participants were recruited via online convenience sampling through class communication channels and WhatsApp. Although efforts were made to reach diverse groups, the non-random, self-selected sample may not be representative of all LASUCOM undergraduates, limiting generalizability. The inclusion criteria encompassed undergraduate students enrolled at LASUCOM for a minimum of one academic year. Conversely, the exclusion criteria included undergraduate students who were unwilling or unable to participate in the study.

Data were collected using an online questionnaire comprising closed-ended questions utilizing Likert scales and multiple-choice questions. The questionnaire was structured into four sections: demographic information, the ICT Engagement Scale, the Knowledge Acquisition Scale, and open-ended questions. Prior to its administration to the main sample, the questionnaire was validated by experts and pilot-tested with a small group of students. The questionnaire was distributed by the respective class heads of communication (HOC) and social media platforms, specifically WhatsApp, with an attached consent letter. The data collection period was approximately three weeks long. Descriptive statistics were used to summarize the participants' characteristics and their responses. The data were comprehensively analyzed

using SPSS version 26, and the results were presented in descriptive tabular form, including frequency, percentage, and bar charts.

Results and Discussion

A total of 509 online questionnaires were completed and submitted by participants who were undergraduate students at the Lagos State University College of Medicine, Nigeria.

Demographic Characteristics of Respondents

Table 1 presents the distribution of respondents according to demographic variables.

Table 1
Demographic Variables of Respondents

Demography		**Frequency**	**Percentage**
Faculty	Clinical Science	422	83.0
	Basic Medical Sciences	87	17.1
Gender	Male	239	47.0
	Female	270	53.0
Age	15–20 years old	354	69.5
	21–25 years old	149	29.3
	26–30 years old	5	1.0
	31 years and above	1	.2
Level of Study	200 Level	220	43.2
	300 Level	54	10.6
	400 Level	234	46.0
	500 Level	1	.2
	600 Level	0	.0
		509	**100.0**

The data presented in Table 1 indicate that a significant proportion of respondents, specifically 83.0%, were students from the Faculty of Clinical Sciences, compared to 17.1% from the Faculty of Basic Medical Sciences. Gender-based analysis revealed a higher representation of female respondents (53.0%) than male respondents (47.0%) in the sample. Age distribution analysis showed that the majority (69.5%) of respondents were aged between 15 and 20 years, followed by those in the 21–25 age bracket, comprising 29.3% of the sample. Regarding the level of study, the largest group of respondents (46.0%) was in their fourth year, followed closely by second-year students (43.2%).

Level of ICT Engagement Among Undergraduate Students at Lagos State University College of Medicine

The data presented in Table 2 illustrate the extent of ICT engagement among undergraduate students at the Lagos State University College of Medicine.

Table 2
Level of ICT Engagement

S/N	ICT engagement	SA	A	NS	D	SD
1	I actively use digital devices (e.g., smartphones, laptops, tablets) for my academic activities	339 (66.6%)	140 (27.5%)	25 (4.9%)	3 (0.6%)	2 (0.4%)
2	I frequently access online platforms (e.g., learning management systems, educational websites) for my coursework	232 (45.6%)	208 (40.9%)	60 (11.8%)	6 (1.2%)	3 (0.6%)
3	I regularly engage with online educational resources (e.g., e-books, videos, online tutorials) to supplement my learning	231 (45.4%)	213 (41.8%)	56 (11.0%)	12 (1.2%)	3 (0.6%)
4	I participate in online discussions and forums related to my academic studies	155 (30.5%)	218 (42.8%)	115 (22.6%)	19 (3.7%)	1 (0.2%)
5	I feel confident in using various ICT tools and technologies to support my learning	267 (52.5%)	187 (36.7%)	46 (9.0%)	9 (1.8%)	1 (0.1%)

Table 2 indicates that a substantial majority of respondents (479, or 94.1%) reported actively engaging with digital devices such as smartphones, laptops, and tablets for academic purposes. Approximately 454 (89.2%) undergraduates expressed confidence in utilizing various ICT tools and technologies to facilitate their learning. Furthermore, no fewer than 373 (73.3%) of the students stated that they participated in online discussions and forums pertinent to their academic studies. These findings suggest that most undergraduate students at the Lagos State University College of Medicine are extensively involved in using ICT in their daily academic activities.

Major Ways Undergraduate Students Acquire Knowledge Related to Their Studies

Figure 1 presents an analysis of the methods by which undergraduate students acquire knowledge.

Figure 1
Methods of Knowledge Acquisition

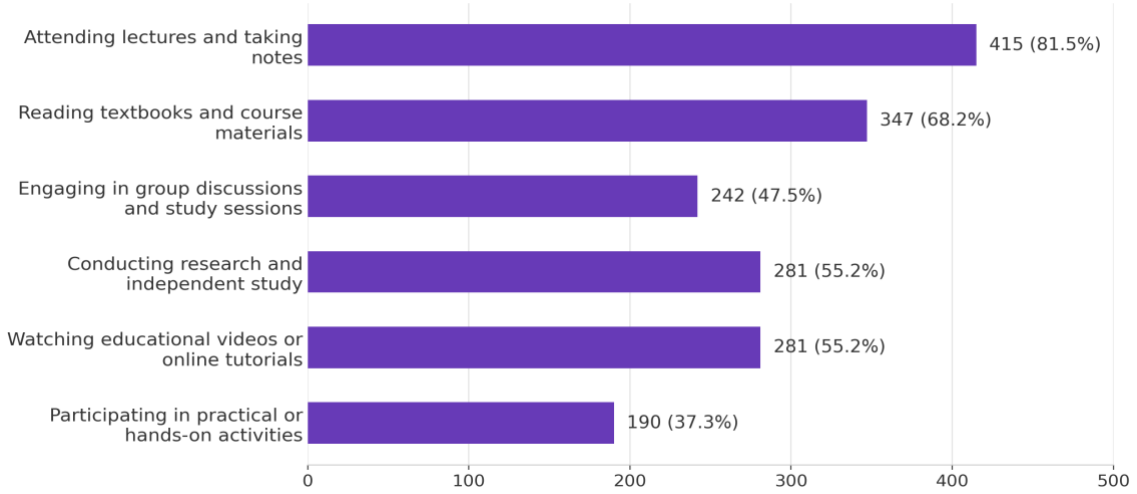

Figure 1 illustrates the primary methods and extent of knowledge acquisition among undergraduate students at Lagos State University College of Medicine. Most respondents (415, 81.5%) reported acquiring knowledge by attending lectures and taking notes. This was followed by 347 (68.1%) respondents who indicated reading textbooks and course materials, while 281 (55.3%) reported engaging in research and independent study and watching educational videos or online tutorials. These findings suggest that undergraduates typically acquire academic knowledge through various means, encompassing both ICT- and non-ICT-related methods.

Knowledge Sources Most Frequently Used and Perceived as Most Helpful by Undergraduates

Figure 2
Sources of Knowledge Acquisition

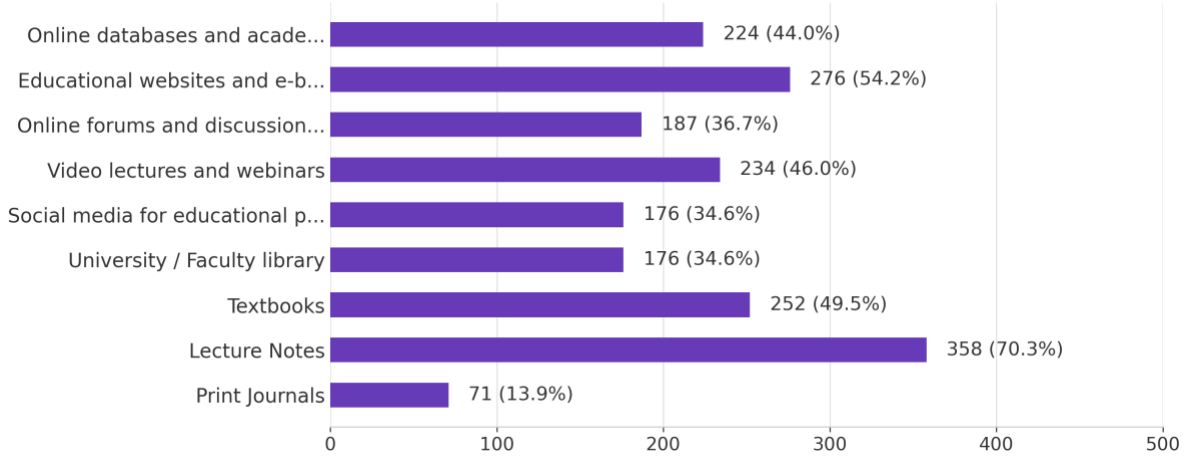

Figure 2 illustrates that most undergraduate students (358, or 70.3%) identified lecture notes as the most beneficial resource for knowledge acquisition. This was followed by educational websites and e-books, with 276 (54.2%) respondents indicating their usefulness. Notably, in this digital era, a significant proportion of students continue to find value in traditional sources, such as print textbooks (49.6%). Video lectures and webinars (45.9%) and online databases

and academic journals (44.0%) are increasingly popular among Nigerian university students. The data also suggest a decline in the use of university and faculty libraries, with only 34.6% of students utilizing these resources for their assignments.

Perceived Effects of ICT Engagement on Knowledge Acquisition Among Undergraduate Students

The data presented in Table 3 illustrate the impact of ICT engagement on knowledge acquisition among undergraduate students at the Lagos State University College of Medicine, Nigeria.

Table 3
Effects of ICT Engagement on Knowledge Acquisition

S/N	Effect of ICT engagement	SA	A	NS	D	SD
1	ICT tools and resources enhanced my understanding of the course content.	292 (57.4%)	183 (36.0%)	30 (5.9%)	4 (0.8%)	1 (0.2%)
2	Access to digital resources expands knowledge beyond that covered in the classroom.	291 (57.2%)	180 (35.4%)	33 (6.5%)	5 (1.0%)	-
3	Engaging with online learning materials helps me develop critical thinking and problem-solving skills.	254 (49.9%)	208 (40.9%)	40 (7.9%)	5 (1.0%)	2 (0.4%)
4	Collaborative online activities (e.g., group projects and online discussions) facilitate knowledge acquisition and retention.	208 (40.9%)	224 (44.0%)	69 (13.6%)	7 (1.4%)	3 (0.3%)
5	Online assessments and quizzes provide me with opportunities to assess and reinforce my learning	235 (46.2%)	218 (42.8%)	51 (10.0%)	4 (0.8%)	1 (0.1%)

Table 3 indicates that 93.3% of respondents believed that ICT tools enhanced their comprehension of course content. This reflects student perceptions; objective measures of comprehension were not collected. Furthermore, 92.5% of the respondents agreed that access to digital resources extended their knowledge beyond traditional classroom instruction. A significant proportion of respondents (90.8%) believed that engaging with online learning materials fostered the development of critical thinking and problem-solving skills. Additional effects of ICT engagement identified by the students included the enhancement of knowledge acquisition through collaborative online activities, as well as the assessment and reinforcement of their learning. However, these findings may be influenced by self-selection bias (more engaged students responding) and social desirability (overreporting positive views).

Discussion of Findings

The demographic analysis of undergraduate students indicates that most (88.7%) fall within the 15–25 year age range. Whether younger students engage with ICT more than older students was not examined in this study and warrants future investigation. Jackman et al. (2021) noted that younger generations show greater digital fluency due to early exposure to technology, offering one plausible explanation. Nearly half of the respondents (46.0%) were fourth-year students. The study design does not permit a comparison of ICT engagement across academic levels, whether engagement varies by year of study, and whether any such variation is attributable to academic demands, which remains an open empirical question for future research.

The findings indicate that most students actively utilize digital devices, such as smartphones, laptops, and tablets, for academic-related activities. This observation is consistent with that of Pokhrel and Chhetri (2021). The results suggest that technology enhances student engagement and success in learning, highlighting the pervasive presence and integration of digital technology in the educational pursuits of undergraduate students. The students expressed confidence in using various ICT tools and technologies to support learning, a finding corroborated by Noor et al. (2022). Digital literacy, defined broadly as the competencies required to find, evaluate, create, and communicate information using digital technologies, is increasingly recognized as a foundational graduate attribute in 21st-century higher education (Reddy et al., 2020). Furthermore, this indicates a high level of technological proficiency and comfort among the student population, reflecting the growing digital competence of university students, who are considered “digital natives” because of their early exposure to technology.

Furthermore, students reported their engagement in online discussions and forums that were relevant to their academic pursuits. This observation is corroborated by Al-Fraihat, Joy, and Sinclair (2020), who suggest that students acknowledge the benefits of utilizing information and communication technology (ICT) for e-learning, which can enhance the academic experience of university students through the integration of e-learning. This finding underscores a significant inclination toward collaborative learning and the use of online platforms for academic discourse, which also facilitates peer-to-peer learning and engagement (Chiu 2022; Pokhrel & Chhetri 2021). Additionally, the findings suggest that the respondents possessed a certain level of digital citizenship skills, including the ability to access, communicate, collaborate, create, and participate in online activities, as supported by Jackman et al. (2021). These findings indicate that the majority of undergraduate students at the Lagos State University College of Medicine extensively engaged with and utilized ICT in their daily activities for both academic and non-academic purposes.

Despite the pervasive use of digital technology and the extensive engagement of undergraduate students with ICT, the findings highlight the multifaceted nature of information sources, with lecture notes, educational websites, and e-books emerging as the most prominent channels for knowledge acquisition in this study. This underscores the enduring importance of traditional classroom instruction (Martín-Lucas & García del Dujo, 2022) and print media in the learning process and information acquisition. Even in the digital age, handwritten or typed lecture notes remain a staple among Nigerian students, as supported by Martín-Lucas and García del Dujo (2022) and Pokhrel and Chhetri (2021). This preference may arise from the immediacy and personalized nature of lecture notes, which allow students to capture and review the key concepts presented in class. Similarly, despite the rapid digitalization and proliferation of digital educational resources, a substantial number of students still value the tactile experience

and comprehensiveness of physical textbooks (Martín-Lucas & García del Dujo, 2022; Noor et al., 2022).

Educational websites and e-books have emerged as the second most prevalent source of knowledge among students, alongside video lectures, webinars, online databases and academic journals. This outcome underscores the increasing dependence on digital platforms, such as e-books, online databases, video lectures and webinars, to access educational content (Haleem et al., 2022; Noor et al., 2022; Pokhrel & Chhetri, 2021). The availability of e-books and online educational resources offers students a convenient and extensive repository of information, often supplementing or complementing traditional textbooks (Pokhrel & Chhetri, 2021). This finding also indicates a growing recognition of the significance of online scholarly resources for comprehensive research and academic exploration (Martín-Lucas & García del Dujo, 2022). Notably, a gradual decline in the use of university and faculty libraries has been observed among students since the pandemic. This decrease may reflect a shift in students' information-seeking behavior. In an era dominated by Information and Communication Technology (ICT), students may rely less on physical libraries for their academic information needs.

The findings demonstrate a highly favorable perception among undergraduate students regarding the influence of ICT engagement on their learning experiences and knowledge acquisition. Most respondents acknowledged that ICT tools and resources play a crucial role in enhancing their comprehension of course content, underscoring the significant contribution of technology in facilitating effective learning experiences. This observation aligns with Haleem et al.'s (2022) assertion that digital technologies are fundamental enablers of learning in higher education institutions. Most respondents also concurred that access to digital resources extended their knowledge beyond what was covered in class. Engaging with online learning materials is believed to foster critical thinking and problem-solving skills among students. Alshammari and Alanazi (2023) support this finding, highlighting the potential of technology to enhance learning among nursing researchers. By providing tools and resources, technology enables access to information, collaboration, and networking opportunities, which are crucial for developing critical thinking skills.

The results of this study corroborate existing research that underscores the importance of technology in nursing research. The availability of online databases, search engines, and electronic health records is recognized as enhancing information accessibility for nurse researchers, thereby enabling them to remain informed about the latest research findings (Alsayed et al., 2021). Causal claims and generalization to actual knowledge acquisition require experimental or longitudinal evidence.

Limitations

This study had several limitations. First, the cross-sectional design precludes causal inference; the associations between ICT engagement and knowledge acquisition may reflect confounding by motivation, prior ability, or socioeconomic factors. Second, all data were self-reported, which may have introduced social desirability and recall biases. Third, the sample was drawn from a single institution, with 83.0% of respondents from the Faculty of Clinical Sciences, limiting the generalizability to other disciplines and institutions. Fourth, actual learning outcomes (e.g., exam scores and skill assessments) were not measured, and the findings reflect perceptions only. Fifth, non-response bias cannot be ruled out, as the response rates and characteristics of non-responders are unknown. Future research should employ longitudinal or

experimental designs, include objective performance measures, and sample across multiple institutions and disciplines.

Conclusion and Recommendations

This study documents the coexistence of traditional (lecture notes, print textbooks) and digital resources in medical students' knowledge acquisition practices at LASUCOM. The findings indicate high self-reported ICT engagement and positive student perceptions of ICT's utility at LASUCOM, suggesting that digital tools are valued components of the contemporary learning environment at this institution. However, the cross-sectional, self-report design and single-institution sample limit causal inference and generalizability; convenience sampling and reliance on self-report likely introduced self-selection bias (more digitally engaged students may have been more likely to respond) and social desirability bias (students may have overreported positive views of ICT), which may inflate the reported levels of engagement and positive perceptions. Future research with longitudinal designs, objective performance measures, and multi-site samples is needed to verify these perceptions and assess actual learning impacts.

Lecture notes have emerged as the primary source of knowledge acquisition for a significant majority of students, underscoring the importance of classroom instruction in the learning process. Educational websites and e-books closely follow this trend, highlighting the increasing reliance on digital learning platforms. Despite competition from digital resources, print textbooks have retained their relevance, emphasizing the lasting value of traditional learning materials. The study also revealed a rising trend toward multimedia learning, with video lectures and webinars becoming increasingly popular in the learning process. Furthermore, the use of online databases and academic journals indicates a growing appreciation for scholarly resources in this field. This reflects the evolving learning preferences of students, characterized by their inclination toward diverse and multimedia-rich content.

Only 34.6% of respondents reported using university or faculty libraries, suggesting a relatively low reliance on physical library resources at the time of the survey. Whether this represents a decline over time and whether it reflects a shift toward online platforms cannot be determined from these cross-sectional data. Longitudinal or comparative studies are needed to assess trends in library use and information-seeking behavior. Nonetheless, this finding suggests that libraries may benefit from reassessing their services to remain congruent with current student preferences and practices.

Recommendations and Policy Implications

Based on the study's findings, the following recommendations are proposed primarily for LASUCOM, with tentative relevance to other Nigerian universities pending further research, to enhance students' knowledge acquisition and support their leadership in digital-age education.

1. Enhanced digital literacy programs: Educational institutions must implement comprehensive digital literacy programs to equip students with the necessary skills and competencies to navigate the digital landscape effectively and responsibly.
2. Diverse Learning Resources: Educational institutions are encouraged to offer a comprehensive selection of current and accessible learning resources, encompassing both traditional and digital formats, to accommodate the varied preferences of students.

3. Library Modernization: Libraries should modernize by integrating digital resources and creating collaborative spaces, helping them remain relevant centers for academic engagement and knowledge acquisition.
4. Faculty Training: Faculty members are encouraged to pursue training and professional development to effectively incorporate digital tools and resources into their pedagogical strategies, thereby fostering an enriched learning environment and stronger student engagement with ICT.
5. Accessible E-learning Platforms: Based on the findings from LASUCOM clinical sciences students, it is recommended that LASUCOM invest in user-friendly and accessible e-learning platforms to facilitate seamless access to educational materials, particularly benefiting students with diverse learning needs. Whether similar patterns hold in other faculties, institutions, or regions of Nigeria requires further investigation before generalizing this recommendation nationally.
6. Continual Research and Adaptation: Educational institutions should conduct continuous research to monitor trends in knowledge acquisition, thereby enabling them to adapt their strategies and resources accordingly.

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

In this article, I used the paper pal AI tool for proofreading and refining the language used in the manuscript. Its use was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The outputs were reviewed, adapted, and integrated into my work, which reflects my personal understanding and complies with the academic integrity policies of my institution.

References

Akour, M., & Alenezi, M. (2022). Higher education future in the era of digital transformation. *Education Sciences*, *12*(11), 784. https://doi.org/10.3390/educsci12110784

Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching-learning practices: A systematic review. *Frontiers in Psychology*, *13*, 920317. https://doi.org/10.3389/fpsyg.2022.920317

Al-Fraihat, D., Joy, M., Masa'deh, R., & Sinclair, J. (2020). Evaluating e-learning systems success: An empirical study. *Computers in Human Behavior*, *102*, 67–86. https://doi.org/10.1016/j.chb.2019.08.004

Alsayed, S., Alshammari, F., Pasay-An, E., & Dator, W. L. (2021). Investigating the learning approaches of students in nursing education. *Journal of Taibah University Medical Sciences*, *16*(1), 43–49. https://doi.org/10.1016/j.jtumed.2020.10.008

Alshammari, A., & Alanazi, M. F. (2023). Use of Technology in Enhancing Learning Among Nurses in Saudi Arabia: A Systematic Review. *Journal of Multidisciplinary Healthcare*, *16*, 1587–1599.

Assefa, Y., Tilwani, S. A., Moges, B. T., & Majeed, H. (2025). Unpacking student engagement and its mediating role in predicting the relationship between self-determination and academic satisfaction among undergraduate students in higher education. *Social Sciences & Humanities Open*, *12*, 101797. https://doi.org/10.1016/j.ssaho.2025.101797

Bagheri-Nesami, M., Ahmady, S., & Kohan, N. (2021). Relationship between information and communications technology engagement and online self-regulated learning in nursing students of Mazandaran University of Medical Sciences. *Journal of Nursing and Midwifery Sciences*, *8*(4), 253. https://doi.org/10.4103/jnms.jnms_27_21

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, *2*(2), 113–115. https://doi.org/10.1002/hbe2.191

Baradaran Abdollahy, S., Mahmoodi, F., & Tagavi, N. (2020). Validating the Persian version of the ICT engagement questionnaire. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*, *11*(2), 92–101. https://doi.org/10.30476/ijvlms.2020.85628.1027

Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 coronavirus (COVID-19) pandemic in Georgia. *Pedagogical Research*, *5*(4), em0060. https://doi.org/10.29333/pr/7937

Burgos-Videla, C. G., Castillo Rojas, W. A., López Meneses, E., & Martínez, J. (2021). Digital competence analysis of university students using latent classes. *Education Sciences*, *11*(8), 385. https://doi.org/10.3390/educsci11080385

Chiu, T. K. (2022). Applying self-determination theory (SDT) to explain student engagement in online learning during the COVID-19 pandemic. *Journal of Research on Technology in Education*, *54*(sup1), S14–S30. https://doi.org/10.1080/15391523.2021.1891998

Czerniewicz, L., Trotter, H., & Haupt, G. (2019). Online teaching in response to student protests and campus shutdowns: Academics' perspectives. *International Journal of Educational Technology in Higher Education*, *17*(1), 1–16. https://doi.org/10.1186/s41239-019-0170-1

Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth, D. (2020). Students' Engagement with Information and Communication Technologies. In J. Fraillon, J. Ainley, W. Schulz, T. Friedman, & D. Duckworth (Eds.), *Preparing for Life in a Digital World: IEA International Computer and Information Literacy Study 2018 International Report* (pp. 113–173). Springer. https://doi.org/10.1007/978-3-030-38781-5

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*, 275–285. https://doi.org/10.1016/j.susoc.2022.05.004

Ho, N. T. T., Sivapalan, S., Pham, H. H., Nguyen, L. T. M., Pham, A. T. V., & Dinh, H. V. (2021). Students' adoption of e-learning in emergency situation: the case of a Vietnamese university during COVID-19. *Interactive Technology and Smart Education*, *18*(2), 246–269. https://doi.org/10.1108/ITSE-08-2020-0164

Jackman, J. A., Gentile, D. A., Cho, N.-J., & Park, Y. (2021). Addressing the digital skills gap for future education. *Nature Human Behaviour*, *5*(5), 542–545. https://doi.org/10.1038/s41562-021-01074-z

Kunina-Habenicht, O., & Goldhammer, F. (2020). ICT engagement: A new construct and its assessment in PISA 2015. *Large-Scale Assessments in Education*, *8*(1), 1–21. https://doi.org/10.1186/s40536-020-00084-z

Manca, S. (2020). Snapping, pinning, liking, or texting: Investigating social media in higher education beyond Facebook. *The Internet and Higher Education*, *44*, 100707. https://doi.org/10.1016/j.iheduc.2019.100707

Martín-Lucas, J., & García del Dujo, Á. (2022). Knowledge building in an environment mediated by digital technology: A case study in higher education. *Education and Information Technologies*, *27*, 12041–12059. https://doi.org/10.1007/s10639-022-11304-0

Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, *1*, 100012. https://doi.org/10.1016/j.ijedro.2020.100012

Mpungose, C. B. (2020). Is Moodle or WhatsApp the preferred e-learning platform at a South African university? First-year students' experiences. *Education and Information Technologies*, *25*, 927–941. https://doi.org/10.1007/s10639-019-10005-5

Noor, U., Younas, M., & Aldayel, H. S., Menhas, R., & Qingyu, X. (2022). Learning behaviour, digital platforms for learning, and their impact on university students' motivations and knowledge development. *Frontiers in Psychology*, *13*, 933974. https://doi.org/10.3389/fpsyg.2022.933974

Onyema, E. M., Eucheria, N. C., Obafemi, F. A., Sen, S., Atonye, F. G., Sharma, A., & Alsayed, A. O. (2020). Impact of coronavirus pandemic on education. *Journal of Education and Practice*, *11*(13), 108–121. https://doi.org/10.7176/JEP/11-13-12

Pokhrel, S., & Chhetri, R. (2021). A literature review on impact of COVID-19 pandemic on teaching and learning. *Higher Education for the Future*, *8*(1), 133–141. https://doi.org/10.1177/2347631120983481

Reddy, P., Sharma, B., & Chaudhary, K. (2020). Digital literacy: A review of literature. *International Journal of Technoethics*, *11*(2), 65–94. https://doi.org/10.4018/IJT.2020070105

Rosli, M. S., & Saleh, N. S. (2022). Technology-enhanced learning acceptance among university students during COVID-19: Integrating the full spectrum of Self-Determination Theory and self-efficacy into the Technology Acceptance Model. *Current Psychology*, *43*(1), 1–20. https://doi.org/10.1007/s12144-022-02996-1

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, *61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S. V., Giannoutsou, N., Cachia, R., Mones, A. M., & Ioannou, A. (2023). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. *Education and Information Technologies*, *28*(6), 6695–6726. https://doi.org/10.1007/s10639-022-11431-8

Wargadinata, W., Maimunah, I., Dewi, E., & Rofiq, Z. (2020). Students' responses to learning during the early COVID-19 pandemic. *Tadris: Jurnal Keguruan dan Ilmu Tarbiyah*, *5*(1), 141–153. https://doi.org/10.24042/tadris.v5i1.6153

The Effectiveness of Movie-Based Learning in Positive Psychology on Stress Management, Strengths Identification, and Self-Esteem Among Pre-university Students

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Abstract

In the 21st century, films have been increasingly utilized as educational tools to enhance learners' cognitive, emotional, and social skills. However, few studies have explored their potential in the field of positive psychology. This study examined the effectiveness of the Movie-Based Learning in Positive Psychology (MBL-PP) model on stress management, strengths identification, and self-esteem among 83 pre-university students. A quasi-experimental pretest–posttest design without a control group was employed. The intervention consisted of watching selected films, attending a lecture on positive psychology to promote fundamental knowledge, and analyzing main characters' behaviors based on positive psychology principles to recognize personal strengths. Students also participated in peer discussions using the Johari Window as a tool to explore and analyze their own strengths. Through these activities, they reflected on their personal strengths and recorded their experiences in the Best Possible Self journal. Pre- and post-intervention assessments were conducted to measure changes in stress management, strengths identification, and self-esteem. Results revealed statistically significant improvements in all three variables ($p < 0.05$). These findings demonstrate that MBL-PP is an effective pedagogical approach to promote psychological well-being and fosters the development of personal strengths among pre-university students.

Keywords: movie-based learning, positive psychology, stress management

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Introduction

Senior high school students often experience stress and pressure caused by academic workloads, competitive university entrance, and the developmental challenges of adolescence. According to these situations, they are expected to balance rigorous coursework, extracurricular commitments, and future-oriented decision-making. These pressures can contribute to high levels of anxiety, reduced self-confidence, and difficulty managing emotions effectively. Without appropriate stress management, it can develop into more serious mental health concerns, including depressive disorders.

Realizing one's own strengths can significantly improve self-esteem, because it helps students build a clearer and more positive sense in themselves. Owing to realizing their own competence, they could develop greater confidence and an internal belief in their own potential. According to the correlation between student's strength and self-esteem, there are effective methods to strengthen emotion and behavior. It's called Positive psychology theory, a well-known psychological approach that helps students identify strengths. Positive psychology emphasizes personal growth, resilience, and well-being, providing structured strategies such as, strengths assessments, reflective activities, and character-building exercises. These approaches not only enhance self-esteem but also equip students with healthier ways to manage stress and navigate the challenges of adolescence.

Positive psychology is recognized as a fundamental theory that focuses on understanding and promoting the factors that support human growth and a positive mindset. It aims to study not only what is wrong with people but also what helps them flourish. Movies are considered a convenient and engaging approach to support learning among adolescents. Positive psychology in films can help students manage stress and pressure by presenting uplifting narratives, resilient characters, and hopeful outcomes that model effective coping strategies, potentially sparking similar emotional responses and cognitive shifts in real life. Considering the high levels of stress and pressure experienced by senior high school students, the author designed a learning environment using positive psychology through movie-based learning to strengthen students' self-esteem and emotional management.

Related Studies

Stress and Pressure

Stress in high school students is commonly defined as a psychological and physiological response that occurs when academic or social demands exceed a student's perceived ability to cope. According to TK, stress is the body's nonspecific reaction to any demand placed upon it, which in adolescents often stems from school workload, exams, and performance expectations (Krishnaveni et al., 2021). Singh & Kumari described stress as arising from cognitive appraisal, when students evaluate school-related situations as threatening or overwhelming, stress responses are triggered (Singh & Kumari, 2022). In addition, stress frequently involves emotional strain caused by balancing academic responsibilities, peer relationships, and future planning, making it a significant factor influencing mental well-being (Hazen et al., 2008).

Over the decade, a rapid rate of stress and academic pressure have had serious negative effects on mental health and well-being. Longitudinal research demonstrated that greater academic burden was strongly linked to increase rate of depressive and anxiety symptoms (Wang et al., 2025). Furthermore, large-scale studies reported that high academic stress correlates with

elevated levels of mental distress, decreased school engagement, and poorer self-disclosure to parents, highlighting how persistent pressure disrupts both psychological and social dimensions of students' lives (Chyu & Chen, 2022). A systematic review of school-based intervention programs confirmed these impacts, showing that cognitive-behavioral-therapy–based interventions are among the most effective at reducing academic stress and its harmful consequences (Jagiello et al., 2024).

Stress and pressure among high school levels remain significantly high in the present, driven by competitive academic environments, digital-era distractions, and post-pandemic learning demands. Iqra opined that adolescents frequently report academic overload, fear of failure, and concerns about future education or career pathways as primary stressors (Iqra, 2024). International assessments echoed these trends: the OECD result revealed that more than half of 15 to 17 year olds regularly experience school-related stress, with workload and performance (Win Bo, 2023). In addition, a global survey published in The Lancet Child & Adolescent Health highlights that the transition back to normal schooling after COVID-19 disruptions intensified emotional strain (Hards et al., 2022).

Positive Psychology

Positive psychology is broadly defined as the scientific study of human strengths, well-being, and the factors that enable individuals and communities to grow up. Described it as a shift from a deficit-based model of psychology toward understanding positive emotions, engagement (Ben Buzguța, 2024). According to Banicki, positive psychology emphasizes cultivating virtues and character strengths that enhance resilience and overall life satisfaction(Banicki, 2014). Nevertheless, some researchers concluded that applying positive psychology methods- such as gratitude exercises, strength identification, and positive emotion regulation can improve mental health, reduce stress, and promote long-term well-being (Helwig et al., 2020).

Throughout this decade, positive psychology theory continuously develops along. Antony explained that positive emotions broaden cognitive and behavioral responses, enabling more flexible problem-solving and resilience during stressful situations (Anbarasu & Bhuvaneswari, 2024). Naseem & Khalid found that positive psychology interventions- such as, fostering optimism, gratitude, and meaning contribute to reducing stress levels and improving emotional regulation (Naseem & Khalid, 2010). In addition, a meta-analysis by Rastogi revealed that positive psychology practices were associated with decreasing depressive and stress symptoms, highlighting their effectiveness in enhance psychological well-being and strengthening adaptive coping resources (Rastogi Asso et al., 2017).

Movie-Based Learning

Movie-based learning has gained increasing attention for its ability to enhance engagement, contextualize complex concepts, and support comprehension. Merita opined that films can create emotionally rich and authentic learning environments that improve motivation and promote deeper cognitive processing Ismaili, 2013). Visual narratives also helped learners connect abstract theories to real-world situations, making content more memorable and accessible (Marzuq et al., 2024). Additionally, movie-based instruction facilitated critical thinking and discussion by exposing students to diverse perspectives and cultural contexts, thereby enriching classroom interaction and reflection (Host'ovecký & Štubňa, 2015).

In the present, movie-based learning consistently highlights its effectiveness in promoting deeper understanding, learner engagement, and critical reflection across educational contexts. Russel integrated historical films supported students' contextual understanding and stimulate inquiry-based discussions (ICEN & TUNCEL, 2019). Similarly, research in EFL settings found that using movies as instructional materials can improve learners' listening competence and cultural awareness through exposure to authentic language use (Ismaili, 2013). In higher education, a case study involving business students demonstrated that movie-based scenarios enhance analytical thinking and facilitate the application of theoretical concepts to real-world organizational behavior (Altameemi & Al-Tamimi, 2025).

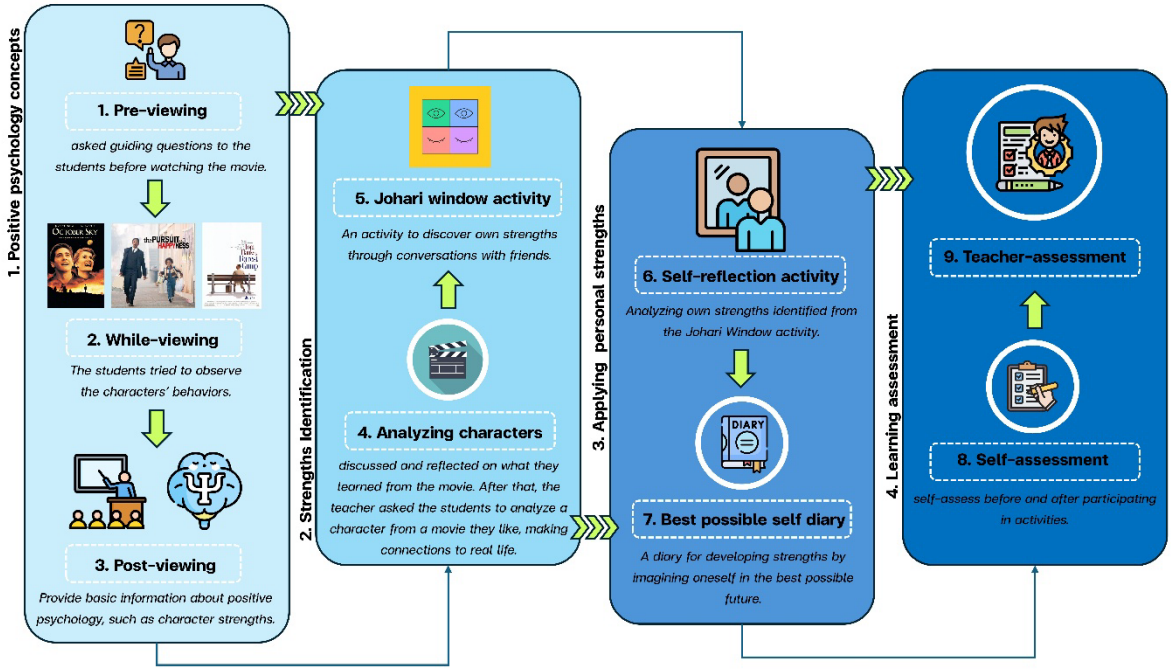
Description of Movie-Based Learning in Positive Psychology on Stress Management, Strengths Identification, and Self-Esteem Among Pre-university Students

Background and Overall Structure

Positive psychology is one of the main topics for Grade 12th students in the course ESC624 The Mentalist, which is part of the story-based learning curriculum at the College of Engineering and Science, King Mongkut's University of Technology Thonburi, Bangkok. The course integrates biology and art. Its purpose is to help Grade 12th (pre-university) students, who often experience high levels of stress and pressure, understand the structure and function of the nervous system and how its development is reflected in good mental health. This knowledge is used as an artistic tool to support daily well-being, improve personality development, strengthen identity formation, and help students manage problems, stress, and pressure more effectively.

Figure 1

The Overall Structure of Movie-Based Learning in Positive Psychology on Stress Management, Strengths Identification, and Self-Esteem Among Pre-university Students (MBL-PP)



The learning process of MBL-PP can be divided into 4 main parts. First, students are introduced to the concept of positive psychology through watching a movie. This part includes three parts: before watching the movie (pre-viewing), the teacher asks guiding questions to prepare students for the key ideas; during the movie (while-viewing), students observe how the characters behave and respond to different situations; and after the movie ends (post-viewing), the teacher leads a discussion and reflection to help students identify the principles of positive psychology shown through the actions of the main characters. Then, as homework, each student analyzes a character from a movie they personally like and connects the character's behavior to real life. This helps students practice recognizing positive behaviors in familiar contexts. The second part focuses on helping students analyze their own strengths. They complete the Johari Window activity with classmates and use the results to understand their personal strengths more clearly. The next part encourages students to apply these strengths in their daily lives and record their experiences in a journal called *Best Possible Self*. The final part involves assessing the students' learning outcomes. The teacher evaluates their understanding of the basic principles of positive psychology and their self-assessment before and after the activities, including changes in stress management, strengths identification, and self-esteem. (Figure 1)

Design of Learning Activity Process

In designing this learning sequence, the four main activities are scheduled across four class sessions, with each session lasting two hours. The plan aims to help students learn the principles and contexts as much as possible through watching movies or using movie-based learning. The details of all activities, from the first to the last, are presented in Table 1 below.

Table 1
Learning Process Designed for MBL-PP

Process	Activity	Particular
Part 1: ***Positive psychology concept***	Pre-viewing	The teacher introduces the activity by asking guiding questions related to students' personal strengths or positive psychology to capture their attention. For example, "Do you know what kind of person you are?" or "Have you ever heard others describe what kind of person you are?" These questions are designed to encourage students to reflect on themselves.
	While-viewing	The teacher plays the movie for the students. In this study, the movie **"*The Pursuit of Happyness*"** was selected. Students are asked to observe the characters' behaviors in response to different situations, as well as their thinking processes and problem-solving approaches.
	Post-viewing	After the movie ends, the teacher guides students to discuss and reflect on what they learned from the movie, summarizing the principles of positive psychology shown through the main characters' behaviors. Then, the teacher assigns homework in which each student analyzes one character from a movie they like and connects the character's behavior to real life.

Part 2: ***Strength's identification***	Analyzing characters	After completing the homework, in which students watch a movie of their choice, they analyze their favorite character to identify the character's strengths. This activity serves as a review and repetition of the in-class movie-watching process, helping students practice and improve the accuracy of their behavior analysis.
	Johari window	Students sit in a circle and discuss with their classmates to share perspectives about themselves. For example, they talk about how they see themselves, their skills, and how their friends see them, including their strengths and weaknesses. Students record the feedback they receive from their friends to use in the next activity for further analysis.
Part 3: ***Applying personality Strength***	Self-reflection	Students use the information from the Johari Window activity to analyze whether their self-perceived strengths match the strengths seen by their friends. This helps students identify their true strengths. However, students have the right to question or do not fully accept feedback from friends if they are confident in their own understanding of their strengths.
	Best possible self-daily	Students applied their identified strengths to their daily lives by writing about their "best possible future self" and setting daily goals that aligned with the person they wanted to become. They then reflected each day on how they used their strengths and how these actions helped them move closer to their expected version of themselves. For example, a student might plan to exercise for 20 minutes and finish one pending task in order to become a more organized person.
Part 4: ***Learning assessment***	Teacher assessment	The instructor assessed students' learning outcomes in various dimensions, such as their understanding of basic concepts in positive psychology, by evaluating their *Best Possible Self* assignments using a rubric.
	Student-self assessment	Students conducted self-assessments on changes in their skills and desirable characteristics before and after participating in the activity. These included aspects such as recognizing their own strengths and weaknesses, reflecting on their personal thoughts, managing stress, self-esteem, planning, and developing a more positive outlook on life.

Research Design

Participant

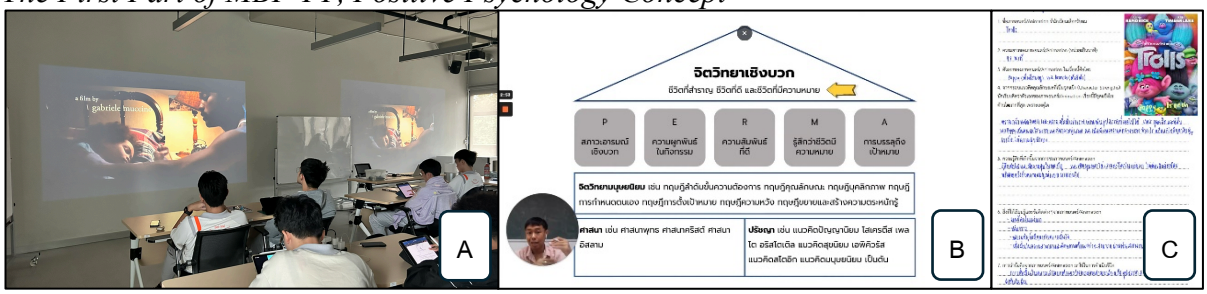
The participants in this study were 83 Grade 12 students from the College of Engineering and Science, King Mongkut's University of Technology Thonburi. They were pre-university students preparing for university entrance examinations and were enrolled in the course ESC624 The Mentalist.

Procedure

The Movie-Based Learning in Positive Psychology on Stress Management, Strengths Identification, and Self-Esteem among Pre-university Students (MBL-PP) consisted of 4 parts which were presented in Figures 2–5.

Figure 2

The First Part of MBP-PP, Positive Psychology Concept



In Figure 2 showed the first part, positive psychology concepts, which introduced students to basic ideas in positive psychology through a movie-based learning activity. This step consisted of three sub-stages: pre-viewing, while-viewing (2A), and post-viewing (2B). Students were also assigned a take-home task (2C) in which they analyzed a main character from the movie they liked. This activity was designed to help them practice identifying positive psychology concepts embedded in the film.

Figure 3

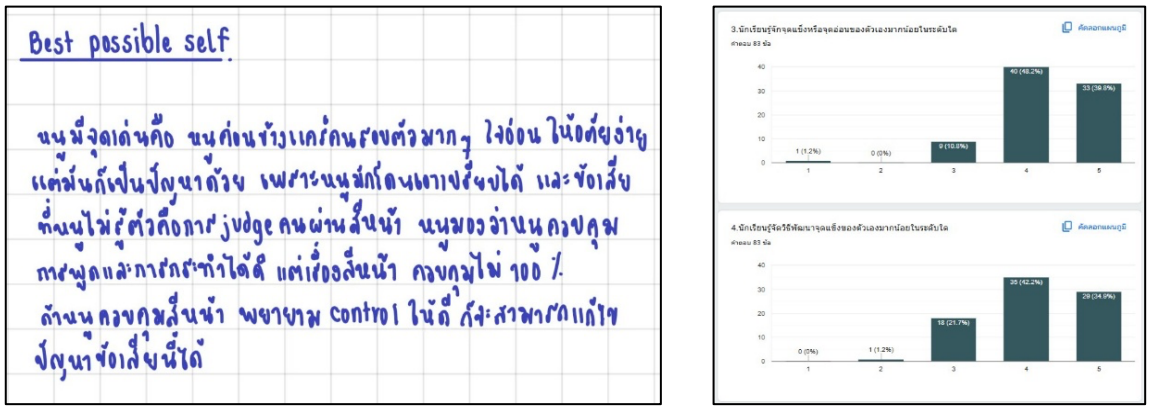
The Second Part of MBP-PP, Strength's Identification

Figure 3 shows Step 2, strengths identification, in which students identified their strengths by completing the Johari Window activity with their classmates. After that, in the next part, students analyzed the strengths identified from the previous activity to see whether they agreed with them. They then practiced applying positive psychology concepts learned from the movie-based learning activity by completing the Best Possible Self Daily task (4A). In the final part (4B), students were assessed by the instructor on their understanding of positive psychology

theory, as well as their self-assessment of various skills before and after participating in the activity.

Figure 4

The Third and Final Part of MBP-PP, Applying Personality Strength and Learning Assessment



Data Collection and Analysis

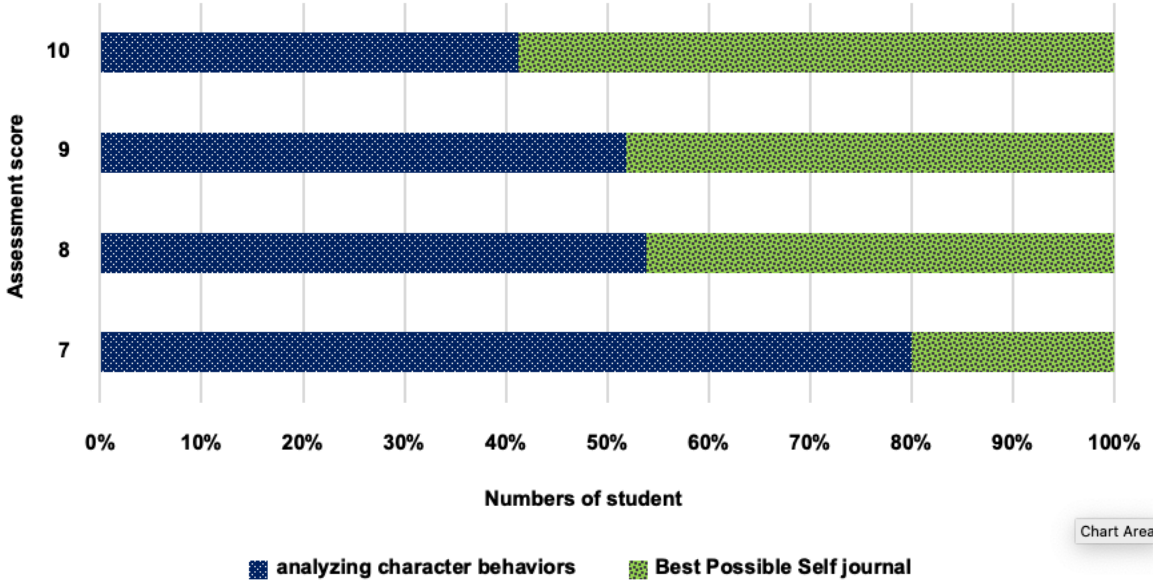
Data collection in this study was conducted using two main methods. First, the instructor assessed students' understanding of positive psychology concepts learned through movie-based learning and related activities. This included evaluating their character analysis, strengths development, and Best Possible Self reflections using a rubric score. Second, students completed self-assessments before and after the activity on various skills, such as stress management, self-esteem, awareness of personal strengths and weaknesses, applying strengths for self-development, positive thinking, and planning. The questionnaire items were adapted from previous research (Cohen et al., 1983; Govindji & Linley, 2007). All data were then analyzed statistically using SPSS with a paired t-test.

Results and Discussion

Learning Achievement

Based on the teacher evaluated the students' work, including the character analysis from their chosen movies and their Best Possible Self daily journals after completing the MBL-PP activities, it was found that the students were able to apply positive psychology concepts correctly in analyzing character behaviors, with an average score of 8.87±0.97 out of 10. Similarly, by using their personal strengths to develop themselves through the Best Possible Self journal, students achieved an average score of 9.81±0.85 out of 10 (Figure 5). These results show that the students understood the principles of positive psychology and were able to apply them effectively in their daily lives.

Figure 5
Score Assessed by the Teacher



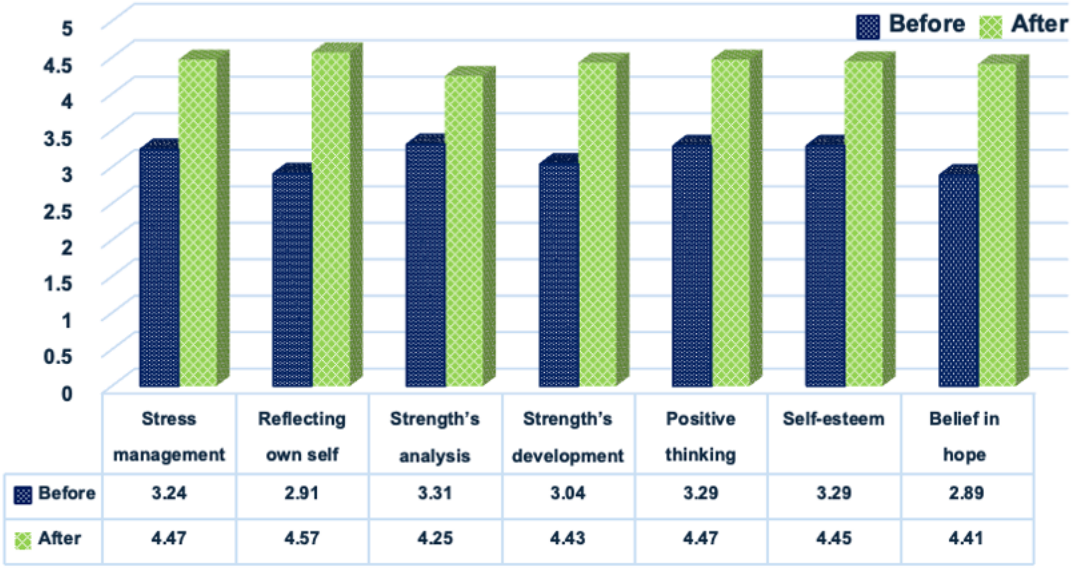
Student Self-Assessment Score

Based on the students' self-assessment after completing the MBL-PP activities, their scores were higher in all learning achievements compared to before the activities. The results, shown in Table 2, indicate that students improved their ability to identify their own strengths and apply them in daily life to manage stress and pressure. They also showed increased confidence, a more positive outlook, and a genuine sense of hope (Figure 6).

Table 2
Students' Self-Assessment Scores Before and After Learning Through MBL-PP

Skills	Experiment	*n*	Mean±SD	*t*	P
Stress management	Before After	83	3.24±0.79 4.47±0.73	6.79	*< 0.001*
Reflecting own self	Before After	83	2.91±0.96 4.57±0.32	11.27	*< 0.001*
Strength's analysis	Before After	83	3.31±0.87 4.25±0.55	6.03	*< 0.001*
Strength's development	Before After	83	3.04±0.65 4.43±0.57	10.53	*< 0.001*
Positive thinking	Before After	83	3.29±0.53 4.47±0.48	8.47	*< 0.001*
Self-esteem	Before After	83	3.29±0.79 4.45±0.54	6.79	*< 0.001*
Belief in hope	Before After	83	2.89±0.49 4.41±0.56	7.67	*< 0.001*

Figure 6
Students' Self-Assessment Scores Before and After Learning Through MBL-PP



Conclusions

In this study, a movie was used as an instructional medium to teach positive psychology. The evaluation focused on students' ability to understand the content and apply positive psychology concepts in their daily lives, such as managing stress, recognizing their own strengths, and maintaining a positive outlook. The results showed that the teachers' assessment scores were very high, and the students' self-assessment scores improved in every skill after completing the activities.

Overall, this study demonstrates that movies can serve as an effective learning tool to help students achieve the intended learning outcomes. It also suggests that teachers should select films that are suitable and aligned with the concepts they want students to learn. In addition, using movies can inspire students to learn from alternative instructional media beyond traditional classroom lectures in the future.

References

Altameemi, M. R. K., & Al-Tamimi, E. R. K. (2025). Visual Learning Environment and Analytical Thinking Skills. *Arab World English Journal*, *16*(1), 439–450.

Anbarasu, A., & Bhuvaneswari, M. (2024). Effect of positive psychology intervention on stress among tribal adolescents in Jawadhu Hills, India. *International Journal of Advanced and Applied Sciences*, *11*(3), 137–148.

Banicki, K. (2014). Positive psychology on character strengths and virtues. A disquieting suggestion. *New Ideas in Psychology*, *33*(1), 21–34.

Ben Buzguța, C. (2024). *An Analysis of the Contribution of Positive Psychology to Character Building*.

Chyu, E. P. Y., & Chen, J. K. (2022). Associations Between Academic Stress, Mental Distress, Academic Self-Disclosure to Parents and School Engagement in Hong Kong. *Frontiers in Psychiatry*, *13*.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*(4), 385–396.

Govindji, R., & Linley, P. A. (2007). Strengths use, self-concordance and well-being: Implications for strengths coaching and coaching psychologists. *International Coaching Psychology Review, 2*(2), 143–153.

Hards, E., Loades, M. E., Higson-Sweeney, N., Shafran, R., Serafimova, T., Brigden, A., Reynolds, S., Crawley, E., Chatburn, E., Linney, C., McManus, M., & Borwick, C. (2022). Loneliness and mental health in children and adolescents with pre-existing mental health problems: A rapid systematic review. *British Journal of Clinical Psychology*, *61*(2), 313–334.

Hazen, E., Schlozman, S., & Beresin, E. (2008). Adolescent psychological development: A review. In *Pediatrics in Review* (Vol. 29, Issue 5, pp. 161–168).

Helwig, N., Yatsevich, D., Vetter, A. C., Wuttke, A. M., & Schmitz, B. (2020). A Comparative Review of Current Research Methods in Positive Psychology Corresponding author Declaration of conflicting interests. *European Journal of Applied Positive Psychology*, *4*, 2020.

Host'ovecký, M., & Štubňa, J. (2015). The impact of film-based learning in science education. *Lecture Notes in Electrical Engineering*, *312*, 531–536.

Icen, M., & Tuncel, G. (2019). Social Studies Education with Cinema Films: A Case Study. *International Online Journal of Educational Sciences*, *11*(1).

Iqra. (2024). A systematic – Review of academic stress intended to improve the educational journey of learners. In *Methods in Psychology* (Vol. 11). Elsevier B.V.

Ismaili, M. (2013). *The effectiveness of using movies in the EFL classroom-a study conducted at South East European University*.

Jagiello, T., Belcher, J., Neelakandan, A., Boyd, K., & Wuthrich, V. M. (2024). Academic Stress Interventions in High Schools: A Systematic Literature Review. In *Child Psychiatry and Human Development*. Springer.

Krishnaveni, G. V., Nagabharana, T. K., Joseph, S., Rizwana, A., Krishna, M., Barker, M., Fall, C., & Kumaran, K. (2021). What stresses adolescents? A qualitative study on perceptions of stress, stressors and coping mechanisms among urban adolescents in India. *Wellcome Open Research*, *6*.

Marzuq, M., Allam, A. S., Najeeb, N., & Sinaj, M. (2024). Short Movies and Narrative Assessment in English Lessons. In *Research Studies in English Language Teaching and Learning (RSELTL)* (Vol. 2, Issue 2).

Naseem, Z., & Khalid, R. (2010). Positive Thinking in Coping with Stress and Health outcomes: Literature Review. In *Journal of Research and Reflections* (Vol. 4, Issue 1).

Rastogi, R., Singh, P., Arora, N., Trivedi, P., & Chaturvedi, D. (2017). Role and efficacy of positive thinking on stress management and creative problem solving for adolescents

Singh, R. K., & Kumari, V. (2022). *Understanding Stress among Adolescents: An Empirical Study*. *10*(1).

Wang, J., Wang, Z., Yang, Y., Wang, T., Lin, H., Zhang, W., Chen, X., & Fu, C. (2025). Academic Burden and Emotional Problems Among Adolescents: A Longitudinal Mediation Analysis. *Journal of Adolescence*, *97*(4), 989–1001.

Win Bo, N. S. (2023). *OECD Digital Education Outlook 2023*. OECD Publishing.

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Virtual Field Trips to Explore Colonial Architecture: Enhancing Historical Comprehension and Soft Skills Through an Online Application Integrating Planning, Digital Literacy, Creativity, and Presentation

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Abstract

This study investigated the effectiveness of virtual field trips in enhancing Grade 11th students' comprehension of colonial history through the architecture (VCAH), while fostering key soft skills via a structured four-stage process: Planning, Digital literacy, Creativity, and Presentation. Utilizing digital tools such as Google Maps and Google Earth, 78 students collaboratively designed virtual travel planning to explore colonial architectural sites. The learning activities guided students through planning their routes, gathering historical information, developing online content, and presenting their group work. A mixed-methods approach was employed to assess learning outcomes. Historical comprehension was assessed through their presentation. Soft skills development mapped to the four-stage process were evaluated through structured student self-assessments using a rubric as a criterion. Results indicate that most students demonstrated measurable improvement in historical knowledge and reported significant growth in all four targeted soft skill, the statistic significant findings ($p < 0.05$). The VCAH model provided an engaging, technology-rich environment that supported both academic learning and the development of 21st century competencies. These findings suggest that well-designed virtual experiences not only can effectively integrate content learning with soft skill but can be also implemented for distance learning instead of on-site field.

Keywords: virtual field trip, colonial architecture, mobile application

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Introduction

Virtual field trips are considered as digitally mediated learning experiences that simulate the exploration of real-world environments through online platforms, multimedia resources, and interactive tools. In contrast to traditional field trips, which require physical travel, VFTs allow learners to access remote locations, historical sites, and cultural landmarks anytime and anywhere. Their significance lies in their capacity to broaden educational access, reduce logistical constraints, and create immersive, flexible learning opportunities that can enhance learners' engagement and understanding of complex subjects. As digital technologies continue to reshape educational practices, VFTs have emerged as the other valuable pedagogical alternatives that support experiential learning and foster deeper comprehension through visual, interactive, and context-rich content.

Colonial architecture is considered as the tangible heritage expressed to the cultural exchange, and socio-political transformations that shaped many contemporary societies. Studying these structures allows learners to analyze how colonial powers integrated foreign design principles with local materials, climates, and traditions, resulting in hybrid architectural forms that reflect both imposition and adaptation. In addition, understanding colonial architecture also deepens learner's awareness of heritage preservation, national identity, and the enduring legacies of colonization visible in today's urban landscapes. By exploring the symbolism, functions, and stylistic elements embedded in these buildings, learners gain a more nuanced comprehension of historical processes and develop critical perspectives on how the past continues to influence present-day cultural and spatial realities.

According to the rapid growing trend of virtual field trips in the present, author applied and integrate this learning approach into the study of colonial architecture in Bangkok's Old Town to enhance accessibility, engagement, and contextual understanding. As schools increasingly adopt digital tools to create immersive learning experiences, virtual field trips offer an effective alternative to on-site visits by enabling students to explore historical environments through interactive maps and multimedia resources. By leveraging this approach, learners were assigned to create travel planning in Bangkok's Old Town without the constraints of physical travel. This integration not only supported students in visualizing and analyzing architectural features in their authentic surroundings but also aligns with pedagogical trends that emphasize flexible, technology-enhanced learning environments which developed the essential skill in the 21st century.

Related Studies

Colonial Architecture

Colonial architecture is widely recognized in academic scholarships as an important dimension of cultural heritage, urban history, and architectural identity. Scholars argue that these built forms are not merely relics of a bygone political order but active testimonies to the social, economic, and ideological processes of colonialism. For example, the study of colonial-era monastic buildings in Panama City underscores how these structures encapsulate religious, institutional, and material values that must be preserved within the built heritage discourse (Hernández & Duarte, 2020). In Southeast Asia, Abu Bakar Abd. Raub's PhD work on hill-station colonial buildings in Peninsular Malaysia demonstrates how construction techniques, materials, and stylistic elements were localized, thereby producing a distinct "tropical colonial" architecture (Bakar & Raub, 2018). The conservation and classification of colonial buildings

also offer major contributions to architectural scholarship. In Bogor, Indonesia, Putri, Kusliansjah, and Hartono examine colonial-era structures to develop a classification system for preservation status, emphasizing authenticity and architectural value (Eka Putri et al., 2022).

In the past decade, scholarship on colonial architecture increasingly focused on its complex sociocultural roles, contested heritage, and adaptive reuse within postcolonial societies. For example, Wei and Wang (2022) explore how colonial-era buildings in Kulangsu, China, were interpreted through competing heritage discourses, it founded that both official and tourist narratives negotiate colonial legacies in nuanced ways rather than reinforcing a single negative framing (Wei & Wang, 2022). Pichet Titha (2024) examined the bungalow tradition in Thailand, revealing how colonial bungalow typologies were localized and hybridized in Siam, thereby illuminating processes of architectural adaptation that reflect climate, social customs, and identity (Titha, 2024). Meanwhile, Malied Khan et al. (2024) analyzed how colonial-era architectural styles in Aden, Yemen—particularly British Neo-Classical facades influenced contemporary design, highlight the enduring aesthetic and symbolic impact of colonial design on modern urban (Khan et al., 2024).

Virtual Field Trip

Over the decade, virtual learning has continuously developed into a pedagogical strategy. VFTs, Virtual Field Trip could transcend geographically, making inaccessible or distant learning environments to students through immersive, multimedia-rich experiences. For instance, Chen and Zhang (2023) conducted a systematic review of K-12 classrooms and found that VFTs often yield positive cognitive and affective learning outcomes, particularly in history and science (Chen & Zhang, 2023). Moreover, some studies have demonstrated that more immersive VFT significantly enhances students' sense of presence, interest, enjoyment, and long-term retention compared to 2D video formats (Makransky & Mayer, 2022). In addition, VFTs have been shown to support equitable, sustainable, and collaborative learning. Leininger-Frézal and Sprenger (2022) illustrate how VFTs in binational teacher training foster experiential learning (Leininger-Frézal & Sprenger, 2022).

Over the past decade, the development of virtual field trips (VFTs) delivered via mobile applications has gained momentum, especially in educational contexts that emphasize inquiry-based and geographically rich learning. For instance, Salsabila developed a mobile-learning virtual field trip app grounded in Education for Sustainable Development (ESD), integrating video, e-modules, and quizzes to support self-directed learning among primary students (Salsabila et al., 2022). Similar to Nakraksa and Khlaisang (2020) proposed a VFT model for upper secondary students that combines the geographic inquiry process with 3D mapping, enhancing spatial thinking and investigative skills (Sriarunrasmee et al., 2015). More recently, virtual game-based field trips operate on mobile devices (Bengel & Peter, 2024). These studies illustrate how mobile-based VFTs are evolving from simple immersive visualizations to sophisticated, interactive learning environments.

Description of Virtual Field Trips to Explore Colonial Architecture in History

Background and Overall Structure

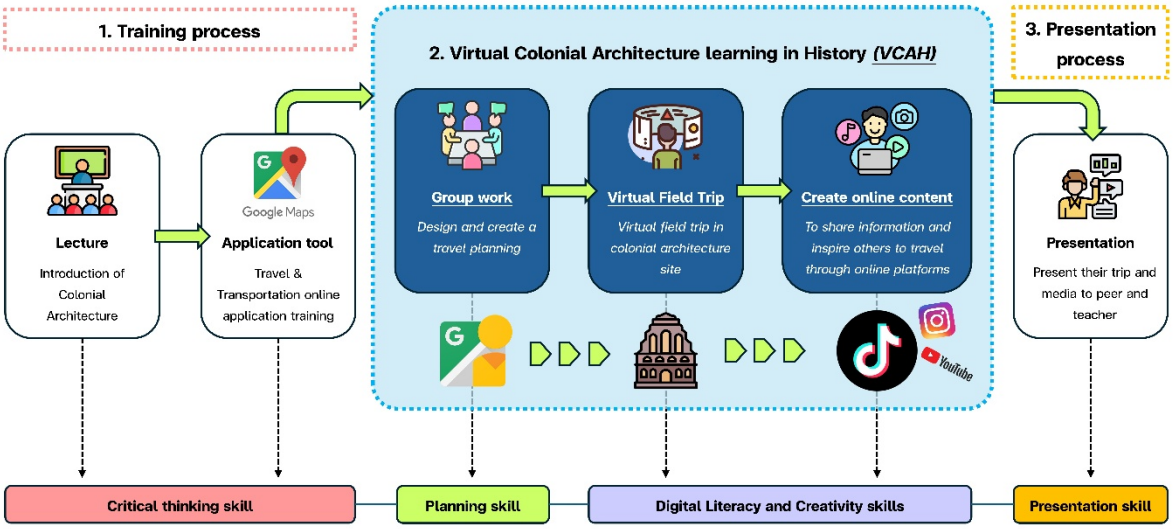
Field Trip's considered as an extra curriculum which's necessary for learner in every level. In particular, the senior high school level, Grade 10th–Grade 12th student in Thailand. In case of Engineering Science College, learners are required to study world history during imperialism

and colonialism period, which's consort with story-based learning as a core program. According to the program's background, authors designed new active learning approach within classroom. By applying mobile learning, and technological tools to study colonial architecture and history through online applications.

This learning session was divided into 3 main processes. Firstly, training process initially started from lecturing the fundamental knowledge about colonial architecture within 20 minutes. Then, learners were trained the online application tools, such as Google map, Google Earth, Google Street View. From this process, learners were anticipated to develop critical thinking skills. Secondly, the Virtual Colonial Architectural field trip, the main learning process that learners did task collaboratively in group. They were required to create travel planning describing the public transportation route from the campus to the colonial historical site in Bangkok in infographic format. Then, they continue to create online content in order to present the transportation route, history, value of those colonial historical sites. From that process, learners developed three essential skills: Planning, Digital literacy, and Creativity skills through online applications. For instance, YouTube, TikTok, etc. Lastly, the presentation, they presented the learning outcomes in class.

Figure 1

The Overall Framework of Virtual Colonial Architecture in History



Research Design

Participants

The participants in this study were 78 students in Grade 11th of Engineering Science College, King Mongkut's University of Technology Thonburi. All participants enrolled in ESC515 The Renaissance course. All participants already learned the history of Colonialism and Colonial Architecture. All participants were assigned to create travel planning and VDO presentation virtually.

Procedure

This study is divided into 3 main processes and 6 sub-steps. Each step was held during class time, and learners continued the work as homework. In each step, the teacher focused on

helping learners develop various skills, such as planning, creativity, online information searching (digital literacy), and persuasive presentation. The details were shown on the table below and Figures 2–3.

Table 1
Virtual Field Trips to Explore Colonial Architecture

Main Process	Sub-Step	Activity	Application Tools
1. Training process	1. Lecture session (20 min)	The instructor gave an introductory lecture about the history of colonial architecture in Thailand and lets the students practice their information-searching skills and analyze the credibility of the sources.	Google Gemini, ChatGPT
	2. Application training (20 min)	The teacher explained how to use travel - transportation applications, such as Google Maps and Google Earth, to the students.	Google Map, Google Earth, Google Street view
2. Virtual Colonial Architectural field exploration in history (VCAH)	3. Information searching and data analysis (20 min)	The teacher divided learners into groups and gave each group a task. Each group chose three colonial architectural buildings in Bangkok. Then, they were required to research the history and value in the context of architectural style.	Google Gemini, ChatGPT
	4. Design the travel route (40 min)	The student created a travel planning, which's comprised of transportation routes from the campus to the historical sites, and three colonial buildings.	Google Map, Google Earth, Google Street view, Canva
	5. Create online content (homework)	The students gather the information and create a storyboard during class. Then, they edit it into online content as homework using applications such as TikTok, Instagram, or YouTube.	Canva, TikTok, Instagram, YouTube
3. Presentation	6. Presentation and assessment (120 min)	Each group presents their Virtual Colonial Architectural field exploration in history (VCAH) for the class to watch, and the students discuss the credibility, content appeal, and appropriateness of the media. After that, the students complete a self-assessment of their skills before and after the activity.	Canva, TikTok, Instagram, YouTube

Figure 2
The Procedure of Virtual Field Trips to Explore Colonial Architecture

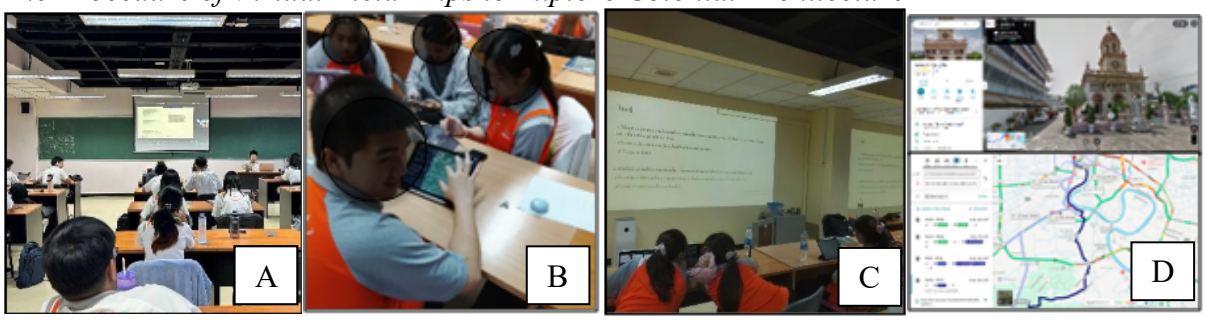


Figure 2 showed the steps learners follow in their learning. It started from attending a lecture (2A), then practicing the use of important applications (2B), followed by forming groups to research the assigned information (2C). After that, each group begins designing their exploration route (2D). After that, each group began searching for information to create online media. They focused on providing details about the place, its highlights, points of interest, and inviting tourists to visit. They also explained how to travel to the location and estimated the costs (3A–3C). Afterward, the students presented their work and evaluated their learning (3D).

Figure 3
The Procedure of Virtual Field Trips to Explore Colonial Architecture

Data Collection and Data Analysis

In this study, there were 2 instruments for evaluating learning achievement. First, ability to create online content and understand historical content. In this assessment, it was evaluated by the instructor based on the rubric (Hardy & Iwatani, 2021). For the soft skill score, author applied OECD Assessment rubric (OECD, n.d.). Second, the soft skill development from self-assessment before and after participating in the virtual field trip. Using self-rate on a scale of 1–5 in each questionnaire. After that, all of data will be analyzed by statistical program using t-test.

Results and Discussion

Learning Achievement by Teacher

From the evaluation of the students' virtual field trip projects (Figure 4), which assessed various skills such as historical comprehension, presentation, creativity, online information searching and analysis (digital literacy), and planning, it was found that learners were able to choose interesting historical locations in Bangkok where feature traces of colonial architecture, such as the Museum Siam, the Ministry of Defence, and the Saranrom Palace. They were also

able to search for relevant information accurately and plan travel routes to these locations, present their work in engaging online media formats. Most learners received an average score between 8.38 and 9.13 out of 10, with creativity and history comprehension being the highest-scoring skill (Figure 5).

Figure 4
Learner's Assignment Outcome

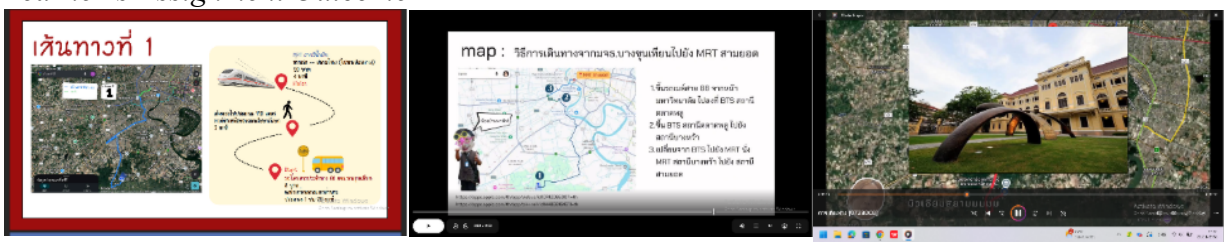
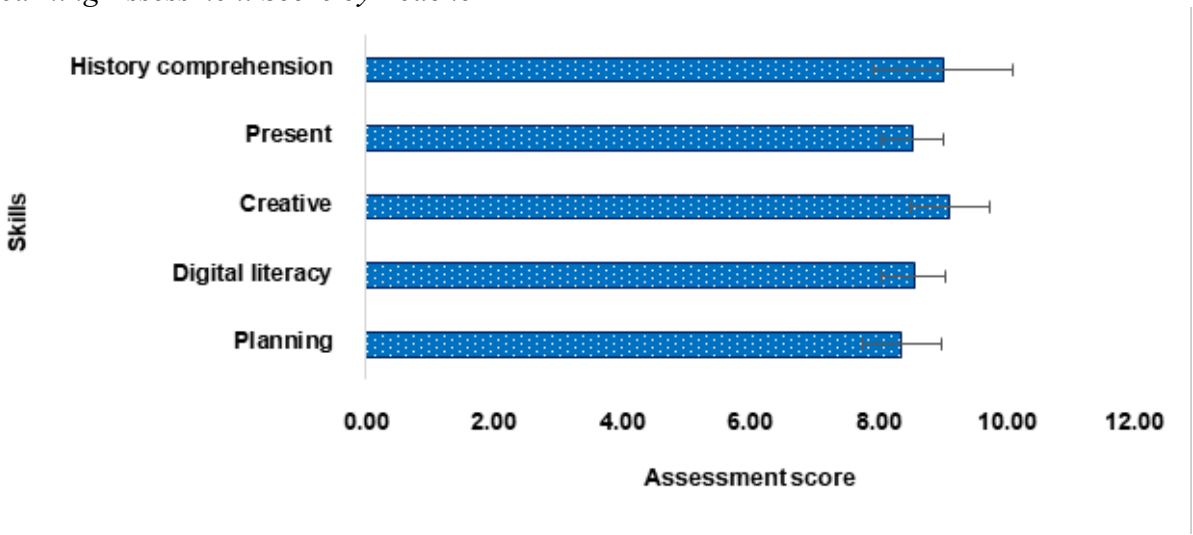


Figure 5
Learning Assessment Score by Teacher



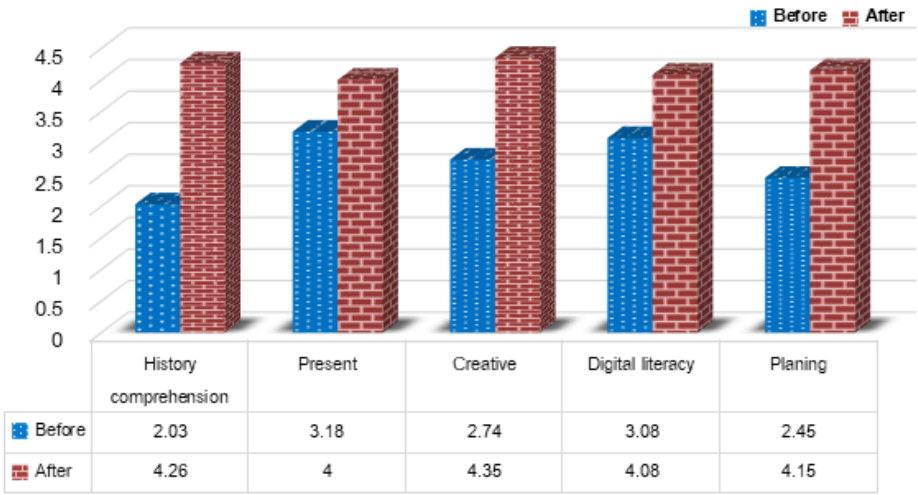
Student Self-Assessment Score

After completing the activity, all learners filled out a self-assessment to compare their skills—such as history comprehension, presentation, creativity, online information searching and analysis (digital literacy), and planning—before and after the activity. The results showed that students' self-assessment scores in all skills increased significantly after the activity, with statistical significance at $P < 0.05$, as shown in Table 2 and Figure 6.

Table 2
Student Self-Evaluation Score Compared With Before and After the VCAH Activity

Skills	Experiment	*n*	Mean±SD	*t*	P
History comprehension	Before	*78*	2.03±0.45	11.54	*< 0.001*
	After		4.26±0.56		
Present	Before	*78*	3.18±0.94	4.21	*< 0.001*
	After		4.00±0.48		
Creative	Before	*78*	2.74±0.56	7.82	*< 0.001*
	After		4.35±0.59		
Digital literacy	Before	*78*	3.08±0.51	4.06	*< 0.001*
	After		4.08±1.42		
Planing	Before	*78*	2.45±0.56	8.83	*< 0.001*
	After		4.15±0.69		

Figure 6
Comparative Learning Assessment Score by Teacher



Conclusion

This study aims to study the effectiveness of Virtual Field Trips exploring Colonial Architecture Site, which assessing Historical Comprehension and Soft Skills, Planning, Digital Literacy, Creativity, and Presentation. This enables learners to develop and apply the essential skill through virtual visiting. Including the historical comprehension associated with World history during Imperialism and Colonialism period. As well as the ability to apply technology in learning, by using applications or online platforms as tools. According to the result, it concludes that learners could develop and increase in both the context of academic comprehension and soft skill from that approach significantly. Nevertheless, this learning approach should be adapted to others field trip where they will answer those hypotheses.

References

Bakar, A., & Raub, A. (2018). *Universiti Teknologi Mara British architecture in peninsular malaysia: An analytical study of architectural characteristics for colonial buildings in hill stations.* Thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy (Built Environment) Faculty of Architecture, Planning & Surveying.

Bengel, P. T., & Peter, C. (2024). Promoting technological literacy through virtual game-based field trips: Effects on knowledge, attitudes, and gender. *European Journal of Geography*, *15*(2), 120–134.

Chen, X., & Zhang, Y. (2023). Virtual Field Trips in K-12 Classroom Teaching: A Systematic Review. *International Journal of Technology in Teaching and Learning*.

Eka Putri, C., Karyadi Kusliansjah, I. Y., & Harastoeti Dibyo Hartono, I. (2022). *The value of architecture in classification of colonial building conservation study case: Bogor karesidenan building 1*. www.journal.unpar.ac.id

Hardy, A., & Iwatani, E. (2021). *Rubrics for Examining Historical Thinking Skills in High School World History Activities and Student Work: Construct Validity Evidence from the Literature*.

Hernández, A. C., & Duarte, S. A. (2020). Colonial architecture in panama city. Analysis of the heritage value of its monastic buildings. *Designs*, *4*(4), 1–18.

Khan, M. A., Hassan, A. S., & Arab, Y. (2024). Investigation of colonial-era architecture style on modern architecture design style in Aden city. *Al-Qadisiyah Journal for Engineering Sciences*, *17*(3), 293–302.

Leininger-Frézal, C., & Sprenger, S. (2022). Virtual Field Trips in Binational Collaborative Teacher Training: Opportunities and Challenges in the Context of Education for Sustainable Development. *Sustainability (Switzerland)*, *14*(19).

Makransky, G., & Mayer, R. E. (2022). Benefits of Taking a Virtual Field Trip in Immersive Virtual Reality: Evidence for the Immersion Principle in Multimedia Learning. *Educational Psychology Review*, *34*(3), 1771–1798.

OECD. (n.d.). *OECD ASSESSMENT RUBRIC*.

Salsabila, T. I., Putra, A. K., & Matos, T. (2022). Mobile Virtual Field Trip and Geography Education: Potential Exploration of Complex Problem Solving and Spatial Intelligence Capabilities. *International Journal of Interactive Mobile Technologies*, *16*(24), 21–31.

Sriarunrasmee, J., Suwannatthachote, P., & Dachakupt, P. (2015). Virtual Field Trips with Inquiry learning and Critical Thinking Process: A Learning Model to Enhance Students' Science Learning Outcomes. *Procedia - Social and Behavioral Sciences*, *197*, 1721–1726.

Titha, P. (2024). Bungalows: Colonial Architectural Heritage from the Bay of Bengal to Siam. *NAJUA: History of Architecture and Thai Architecture*, *21*(2), 237–266.

Wei, R., & Wang, F. (2022). Is colonial heritage negative or not so much? Debating heritage discourses and selective interpretation of Kulangsu, China. *Built Heritage*, *6*(1).

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The Phoenix of Futures: Navigating the Productive Paradox of Futures Methods in Neoliberal Education

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Official Conference Proceedings

Abstract

This hybrid autoethnographic narrative evaluates the emancipatory potential of Futures methods within an education system dominated by neoliberal "Dark Arts." Employing a mixed-methods framework, the research explores whether these methodologies disrupt or reinforce systemic constraints and how this shapes practitioner agency. Findings unearthed a "productive paradox": Futures methods are not inherently liberatory but amplify existing intentions. When utilised uncritically, they produce "old wine in new bottles," (Milojevic & Inayatullah, 2015) merely reinforcing metrics. However, critical and reflexive application allows for *"architecting resistance"* against performative norms. As the research unfolded, one image repeatedly surfaced in my reflections. Initially appearing as a symbol of hope amidst uncertainty, the Phoenix gradually evolved into a conceptual companion for the inquiry itself. It came to represent both Futures methodologies and the human capacity for hope and agency. Like Futures methods, the Phoenix carries transformative potential but no guarantee of transformation. It can illuminate possibilities, but it can also be caged. In this sense, the Phoenix became not merely a literary device but an organising metaphor through which to explore the relationship between imagination, power, hope, and agency. Following its trail would lead me into a labyrinth of scholarship, reflection, and discovery.

Keywords: futures methods, neoliberalism, disruption, agency, hope

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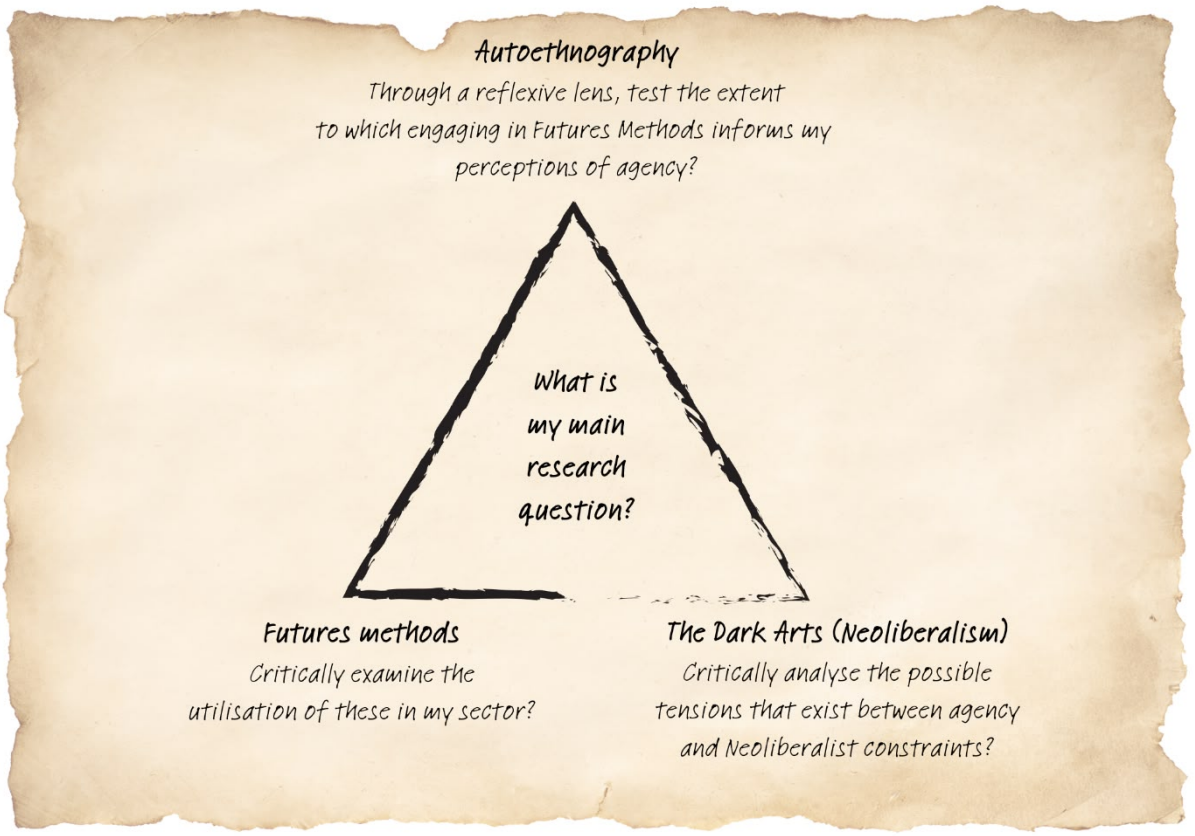
Introduction: The "Thwack of Realisation"

It began with a storm; a sudden *"thwack of realization"* in early 2023 as I encountered critical scholarship on Neoliberalism (Ball, 2016; Barth & Rieckmann, 2012; Colla et al., 2022; Lehtonen et al., 2022; Weaver, 1993) concepts such as performativity and accountability cultures that ceased to be abstract theories and became recognisable features of the educational landscape I had inhabited for almost two decades. What had previously appeared to be isolated frustrations, tensions, and contradictions within Scottish Further Education suddenly formed a coherent picture. This realisation was profoundly uncomfortable. Throughout my career I had worked in roles intended to foster innovation, imagination, and change. Recently, I had facilitated workshops that encouraged educators to think differently and generate new ideas, yet I found myself questioning whether such activities genuinely challenged dominant structures or merely helped organisations achieve existing targets more efficiently. If innovation is pursued primarily in service of performance indicators or institutional metrics, can it truly be transformative? Or does it simply become another expression of neoliberal performativity?

At the same time as the storm was gathering, I was encountering Futures methodologies. While critical educational scholarship was helping me understand the present, Futures Studies seemed to offer a language for possibility. These methods promised opportunities to surface hidden narratives and imagine alternative futures however the more I engaged with them, the more I encountered a troubling paradox. Futures methodologies are frequently presented as emancipatory, capable of fostering hope, agency, and transformative thinking. Equally, Futures scholars (Ahlqvist & Rhisiart, 2015; Chappell et al., 2024; Dunne & Raby, 2013; Meretoja, 2023; Miller et al., 2019; Milojevic & Inayatullah, 2015) caution that these same methods can be reduced to technocratic exercises, utilised in ways that reinforce existing power structures rather than disrupt them. What happens then, when people are invited to imagine futures, they may not have the power to create? And what then is the impact on their hope and agency when they are led into this paradox?

To explore this question, I adopted an analytical Autoethnographic approach (Adkins & Hughes, 2020; Keleş 2022; Mao et al, 2024; Mason, 2011; Stutchbury, 2022) positioning my own experiences as both practitioner and researcher as a legitimate site of inquiry. Through early iterations of the study, it became apparent that this approach, narrowing the scope as opposed to widening it, would not only fit the time constraint but had greater potential of informing developments in my professional practice.

Figure 1
Triangulation of Curiosities



Triangulating these elements (Fig. 1), Neoliberalism, Futures Methods and Autoethnography led to the emergence of my main research question: To what extent do Futures methodologies disrupt or reinforce dominant narratives within an education system driven by metrics and neoliberal ideology, and how does this shape my sense of agency as a practitioner within that system?

As I gazed entranced at the image appearing before my eyes, a whispering voice filled the air:

'To meet me, you must first consult those who have been before,
The Messrs and Ministers who have sought and knocked on the door,
Who have left paths and footprints, relics and clues,
So that those who come next can walk in their shoes...'

Literature Review: Consulting the "Messrs and Ministers"

Tumbling into a deserted library, piles of crimson feathers piqued my curiosity. As the thunderstorm raged on outside, and bolts of lightning illuminated paths through an abundance of literature, I found myself drawn repeatedly towards a central tension. Futures methodologies are frequently presented as tools for transformation, imagination, and empowerment. Yet the environments in which they are often deployed (institutions shaped by metrics, accountability mechanisms, and neoliberal assumptions) can constrain the very possibilities these methods seek to create. The further I explored, the more curious I became as to whether Futures methodologies act as catalysts for disruption, or whether they

sometimes become absorbed into existing systems, reproducing the dominant narratives they are intended to challenge.

Flight Paths and False Starts: The Utilisation of Futures Methods

The first revealed a substantial body of literature positioning Futures methodologies as tools for expanding imagination, challenging assumptions, and cultivating anticipatory capacity. Scholars such as Inayatullah (1998, 2008), Hicks (2012), Miller (2018), and Karaiskou (2024) argue that Futures work is less concerned with prediction than with enabling individuals and organisations to think critically about the forces shaping tomorrow. Methods including Causal Layered Analysis, Futures Literacy, and speculative approaches create opportunities to explore alternatives to dominant trajectories and encourage engagement with uncertainty. Much of this literature is optimistic: Futures methods are often associated with increased creativity, reflexivity, confidence, and hope, helping participants develop more active relationships with the future. Futures Literacy has been linked to enhanced anticipatory capabilities and the ability to rethink assumptions about what is possible (Mangnus et al., 2021; Miller, 2018). Yet alongside the advocation for Futures methods sat a recurring critique; while these approaches may broaden horizons, evidence of lasting transformation remains limited. Futures interventions often increased awareness, reflection, and imagination, but whether they resulted in meaningful change is less clear (Damhof & Gulmans, 2023; Van Lente & Peters, 2022). Milojević and Inayatullah (2015) caution against what they describe as “old wine in new bottles,” where innovative methods become vehicles for existing agendas rather than catalysts for transformation.

A second bolt illuminated a large birdcage suspended in the distance, as a bundle of feathers settled softly around the periphery.

Caged Wings? Futures Methods as Disruptive or Reproductive

The image proved unexpectedly apt. Futures methodologies are frequently portrayed as disruptive practices capable of challenging dominant assumptions and creating space for alternative futures. Their emphasis on plurality, imagination, and reflexivity appears fundamentally at odds with systems driven by certainty, measurement, and control. Scholars such as Ross (2022), Mangnus et al. (2021), and Damhof and Gulmans (2023) argue that Futures work can expose hidden assumptions and challenge dominant narratives through acts of imagination and critical reflection. However, a competing story emerged within the literature. Methods do not operate independently of context. Organisational cultures, political priorities, and existing power structures shape how methods are interpreted and enacted. As a result, Futures approaches can become incorporated into institutional systems rather than disrupting them. Organisations may adopt the language of futures thinking, creativity, and innovation while leaving deeper assumptions entirely intact. The metaphor of the cage became increasingly compelling. Like the unseen presence whose crimson feathers had appeared throughout my investigation, the capacity for transformation can be celebrated while simultaneously constrained. Imagination may be encouraged, yet carefully managed. Participation may be invited yet bound by organisational priorities.

As the storm intensified, a third flash of lightning illuminated something larger moving in the shadows.

Shadows of the Slouching Beast: False Agency in Neoliberal Systems

Here the narrative shifted from methods to agency. Ball (2016), Biesta (2017), Bonal (2003) and De Lissovoy (2018) describe neoliberalism not simply as an economic doctrine but as a mode of governing behaviour. Through metrics, accountability systems, audits, and performance indicators, individuals are encouraged to become entrepreneurs of themselves, responsible for navigating increasingly complex challenges. Within such systems, agency becomes complicated. Several authors raised concerns regarding the emergence of what might be termed as *false agency*; the notion that individuals may be invited to contribute ideas, imagine alternatives, and participate in innovation initiatives, while lacking meaningful influence over the structures shaping their environment. In this situation, empowerment becomes symbolic rather than substantive. Participation is offered, but transformation remains elusive. This resonated strongly with my own experience and I recognised organisational contexts where educators were encouraged to innovate but only within carefully defined boundaries. Creativity in these contexts appeared welcome provided it aligned with institutional priorities, and Imagination valued when it improved metrics. The implications for Futures methods then were significant: if participants are invited to imagine futures and do not possess the power to implement these imaginings, are these methods generating agency or merely the appearance of it?

With the final flash of lightning, rather than illuminating a path ahead, it revealed footprints left by those who had travelled before.

Footprints in the Ashes: Autoethnography and Futures Practice

As I explored existing studies in this field, I discovered that comparatively little research had examined the relationship between Futures methods, practitioner agency, and neoliberal educational systems through lived experience. Much of the literature evaluated participant outcomes, workshop impacts, or organisational interventions. Far fewer studies explored how individuals experience the tensions, contradictions, and possibilities of Futures practice whilst simultaneously inhabiting systems shaped by performativity and measurement. This absence revealed an opportunity.

Autoethnography therefore offered a way to position lived experience at the centre of my inquiry. Rather than studying Futures methods from a distance, I could place myself directly within their operation, examining how my own assumptions, perceptions, hopes, and sense of agency shifted throughout engagement with the methods. Analytical autoethnography (Ellis et al., 2011; Hughes & Pennington, 2017) provided a means of connecting personal narrative to wider cultural and organisational concerns, allowing exploration of the spaces where Futures methodologies, neoliberal systems, and practitioner identities intersect.

At this stage, the crimson feathers no longer felt accidental. The Phoenix had not yet appeared, but its presence was growing. As the last rumble of thunder echoed across the horizon, the trail led to a door, its emerald surface outlined in gold. Beyond it, lay the Ministry of Methods, and there, for the first time, I encountered the Phoenix.

Methodology: The Ministry of Methods

The trail led to a room lined with glowing orbs. In the centre stood a Phoenix, majestic and mysterious. Its polished perch reflected the deep crimson colour of its plumage, and the room

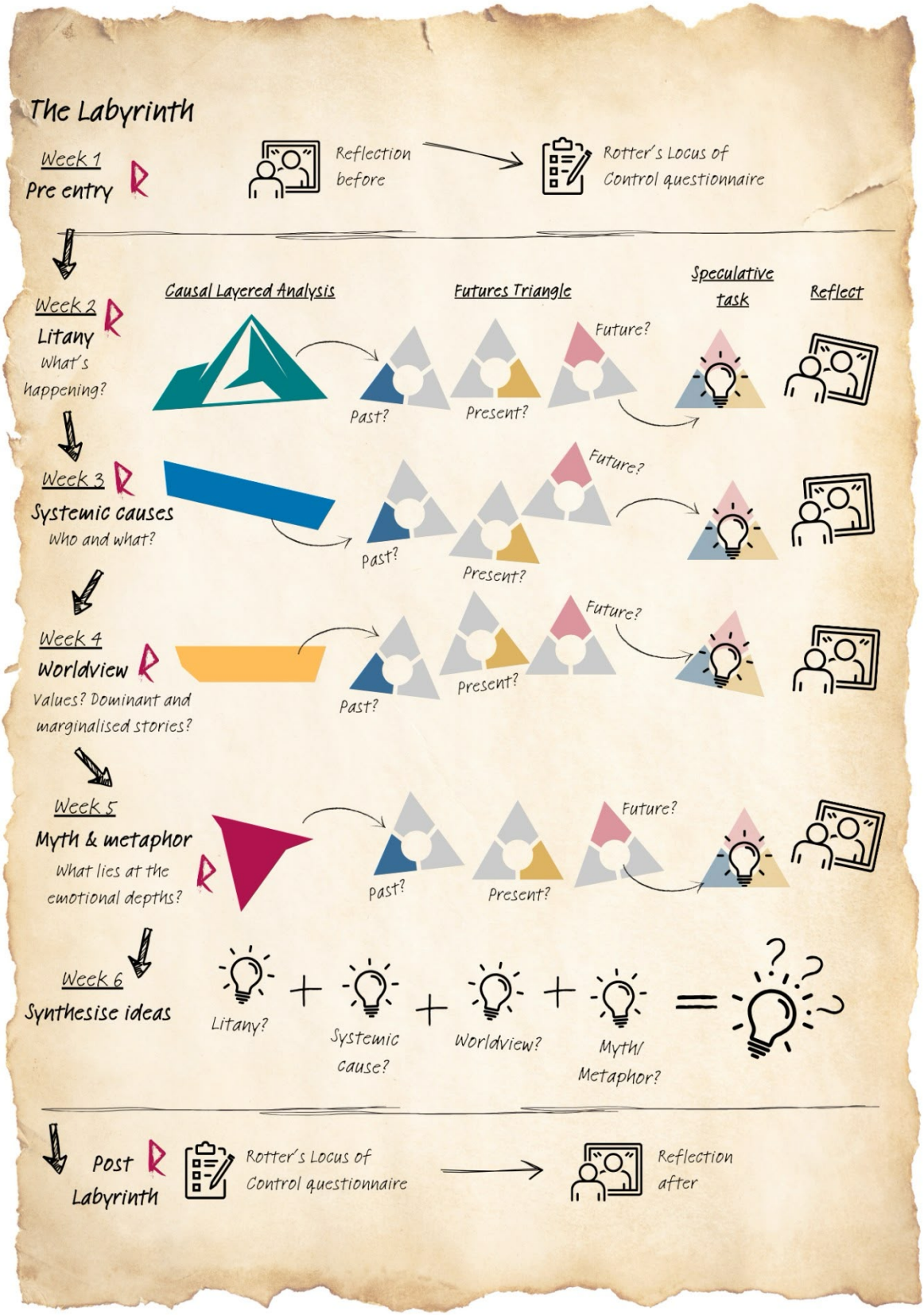
radiated from the glow if it's mighty presence. Timidly I edged into the room, bowing my head as it turned to greet me.

> 'Jo, I am the Phoenix of Futures. Watching your journey these past two years has been fascinating. It's now a pleasure to guide you into the next stage of your quest.'
>
> 'You've been with me this entire time? I feel I've learnt so much, but at the same time I don't feel I know enough about Futures yet…'
>
> 'Fear not, your curiosity is strong; it brought you to me and I will be by your side for the rest of your journey. Now I know why you are here, but what is your gut feeling regarding the shape of the journey that you would like to go on?'
>
> 'I need entanglement, no isolated methods. A spliced approach creating complementary practice with ebb and flow, facilitating reflexive creativity. I want methods that help navigate tensions between hope and constraints (Baumeister & Alquist, 2023), and resist cultures of measurement as Biesta (2017) encourages. Which Futures methods might allow me to do this?'

As the Phoenix listened, random orbs lit up around the room. Some remained ignited, others faded until three permanently glowed with warm mustard hues. The orbs then floated down and hovered between us.

"These three methods will intertwine to form your study, your Labyrinth (Fig. 2). I've chosen Causal Layered Analysis (CLA), The Futures Triangle, and Speculative analysis."

Figure 2
Map of the Labyrinth



Excavating Beneath the Surface: Causal Layered Analysis

Causal Layered Analysis (CLA) (Inayatullah, 1998; 2004) became the primary excavation tool within the study. The method examines issues across four interconnected layers: Litany, Systemic Causes, Worldview, and Myth/Metaphor. Rather than accepting problems at face value, CLA seeks to uncover the deeper narratives, assumptions, and cultural stories through which realities are produced. This was particularly relevant to the core of the study. If neoliberalism operates not only through policies and structures but also through taken-for-granted assumptions about success, accountability, performance and value (Ball, 2016; Biesta, 2017), then a methodology capable of moving beneath surface manifestations was essential. CLA offered a way of systematically examining my experiences within Scottish Further Education whilst revealing the deeper narratives sustaining them.

Mapping Pressures and Possibilities: The Futures Triangle

Next, the iceberg dissolved and was replaced by a glowing triangle suspended in mid-air. The Futures Triangle (FT) (Inayatullah, 2023) provided a complementary lens through which to explore the forces shaping perceptions of change. The method examines the interaction between three dimensions: the weight of history, the push of present conditions, and the pull of future possibilities. Where CLA helped reveal the architecture of existing narratives, the FT enabled exploration of why some futures felt imaginable and others remained difficult to envision. The model offered a means of examining the tensions between inherited assumptions, contemporary systemic constraints, and aspirational alternative futures. For a study concerned with agency, this was particularly important. Agency does not emerge in isolation and the FT provided a way of situating hope and possibility within broader systemic contexts whilst exploring the extent to which dominant narratives shape future imaginaries.

Imagining and Envisioning: Speculative Practice

Finally, a lightbulb flickered on. The Phoenix explained “analysis alone will not be enough.” Speculative practice (Candy & Dunagan, 2017; Dunne & Raby, 2013; Springgay & Truman, 2018) was selected as the creative bridge between reflection and action. Building upon insights generated through CLA and the Futures Triangle, speculative exercises encouraged the construction of alternative narratives, artefacts, and future possibilities. While CLA excavates and the Futures Triangle analyses, speculative practice imagines. Its inclusion was particularly important given the study's interest in hope and agency. If participants are to move beyond critique toward possibility, there must also be opportunities to explore what alternatives might look and feel like in practice. Speculative artefacts therefore served not as predictions but as provocations; tangible expressions of possible futures against which current assumptions could be examined.

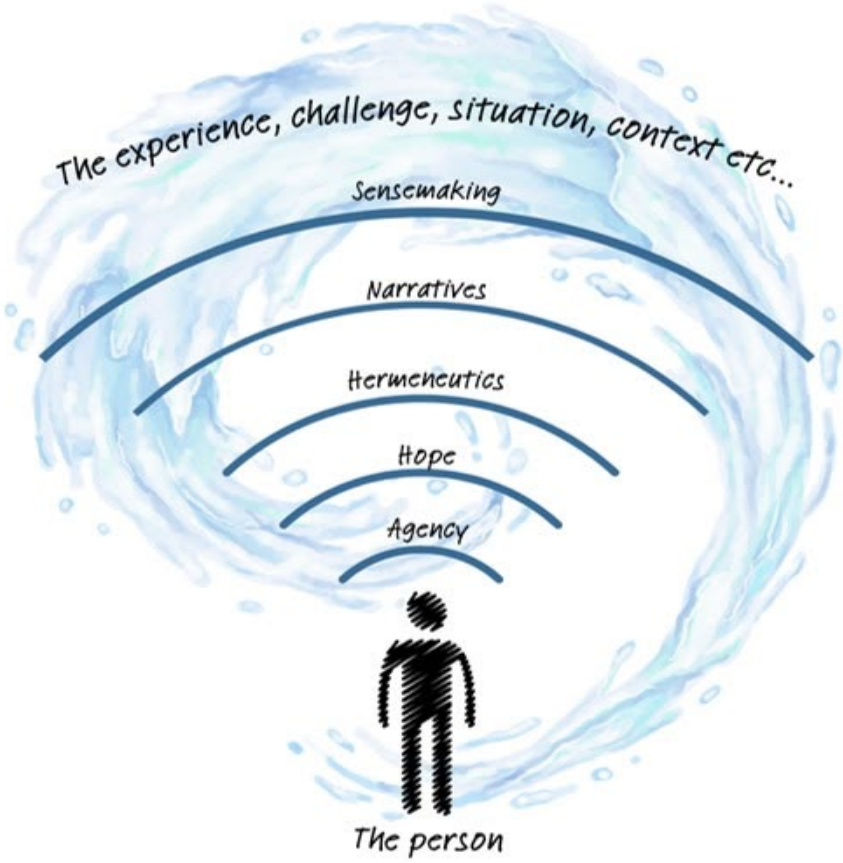
The Pool of Theoretical Lenses

We came to a stop at a large pool with crystal-clear water reflecting bottles and vials around its edge. The Phoenix dipped its beak into the water, creating gentle ripples that lifted five small bottles into the air that drifted across the surface.

“While having data is useful, you need theoretical frameworks for analysis. These five theories will correlate to support your post Labyrinth analysis and feed into your research

themes, namely the key concepts for individuals in Neoliberalist structures." A diagram appeared on the water's surface depicting the relationality the Phoenix described. (Fig. 3)

Figure 3
Theories as Lenses



The first revealed shifting patterns and fragments of meaning. Sensemaking Theory (Manolchev, 2020; Weick et al., 2005) offered a framework for understanding how experiences become organised into coherent interpretations. The second reflection appeared as a tapestry of interconnected stories. Narrative Theory highlighted the role narratives play in shaping identities, actions, and perceptions of possibility (Bruner, 1998; Frank, 2002). A third image shimmered beneath the surface before dissolving and reforming. Hermeneutics emphasised the interpretive nature of understanding itself, recognising that meaning is continually negotiated rather than simply discovered (Barrett et al., 2011; Geanellos, 2000; Ricoeur, 1981). The fourth reflection appeared as pathways branching toward distant horizons. Hope Theory (Snyder, 2002) provided a way of understanding how individuals identify routes toward desired futures and sustain motivation to pursue them. Finally, the water revealed a figure standing before a series of closed gates. Agency Theory (Bandura, 2005) offered a lens through which to examine the relationship between individual action and structural constraint. Together, these theories became interpretive companions for the journey ahead.

Data Collection: Gathering the Runes

The research adopted an analytical autoethnographic approach (Ellis et al., 2011; Hughes & Pennington, 2017), positioning my experiences as practitioner and researcher as legitimate

sites of inquiry. To strengthen reflexivity and provide multiple perspectives on the phenomenon, both qualitative and quantitative data were collected throughout the Labyrinth within a structured Labyrinth journal, which captured responses to prompts, reflections, observations, and creative activities undertaken at each stage of the journey. These entries documented moments of uncertainty, insight, frustration, imagination, and discovery. Alongside these reflections, quantitative measures were collected at regular intervals. Self-assessment scales were used to track fluctuations in hope and agency throughout the process. Rotter's Locus of Control questionnaire was completed prior to and following the Labyrinth to identify shifts in perceptions regarding personal influence and control. To synthesise these experiences, each stage of the Labyrinth was represented by a symbolic "rune." These runes functioned as reflective artefacts, capturing significant moments, insights, and tensions encountered throughout the inquiry. While primarily narrative devices, they also served as analytical anchors that enabled connections to be drawn between qualitative reflections, quantitative measures, and theoretical interpretation.

The storm had revealed the question. The literature had revealed the tensions. The Ministry of Methods had revealed the tools. All that remained was to enter the maze itself and discover what would emerge when Futures methodologies encountered the realities of a measured educational system.

Results: Reading the Runes

Emerging from the Labyrinth, I found myself standing once more beneath an open sky. The storm that had accompanied much of the journey had begun to break, although clouds still gathered on distant horizons. Beside me sat the Phoenix, quieter now than when we first met. There was something different about it. Wisps of smoke drifted from its feathers and, although I could not yet explain why, I sensed our time together was nearing an end. Spread across the ground before me were the runes collected during my six weeks within the Labyrinth. Each represented a stage of the journey and together, they offered a means of revisiting the experiences, reflections, and quantitative shifts in hope and agency that had emerged throughout the inquiry. As I examined them, a pattern began to reveal itself. Engagement with Futures methodologies did not produce a straightforward increase in either hope or agency. Instead, both fluctuated, often independently, revealing a far more complex relationship between seeing possibilities and believing they can be realised.

First Rune: Entering the Labyrinth

The first rune bore the number eleven, representing my initial Locus of Control score and indicating a strongly internal orientation. Before entering the Labyrinth, I already believed that my actions could influence outcomes, yet this sense of agency existed alongside considerable frustration. My reflections revealed growing awareness of neoliberal narratives shaping Scottish Further Education: measurement, performance, accountability, and continual pressures to do more with less. I could identify opportunities for change, but I remained uncertain whether meaningful change was possible. Hope was therefore comparatively fragile despite a relatively strong sense of personal agency. Looking back, the first rune already contained the seeds of the study's central tension. I felt capable of acting, but doubtful that systems would respond.

The Phoenix watched silently.

Second Rune: Seeing the Surface (Litany)

As I revisited my reflections, familiar organisational phrases emerged repeatedly: *"The funding council needs us to..." "If it's not in the strategy, we can't do it..." "We're not allowed..."* These statements reflected a culture where legitimacy appeared strongly connected to compliance, targets, and measurable outcomes. Through CLA, I was no longer simply observing these narratives; I was explicitly naming them. Doing so, however, produced an unexpected effect. While my agency remained relatively stable, my hope declined noticeably. This was one of the first major surprises within the data. Futures methodologies expanded my capacity to imagine alternatives, but they simultaneously exposed the scale of the challenge. The gap between what could be and what currently was became more visible. Rather than producing optimism, the Litany stage initially made Futures thinking feel somewhat depressing. Possibility had increased, but confidence in systemic transformation had diminished.

The Phoenix shifted beside me, a faint wisp of smoke escaping from its wings.

Third Rune: Understanding the Machinery (Systemic Causes)

Moving beneath surface symptoms, I began identifying structural forces underpinning the narratives encountered during Litany: performance indicators, organisational habits, accountability systems, funding structures, and assumptions about whose ideas matter. Curiously, this was where hope began to rise again. Initially this seemed counter-intuitive; why would deeper examination of constraints increase optimism? The answer appeared to lie in visibility. Once nebulous frustrations became identifiable systems, they felt less immovable. Instead of confronting an abstract and omnipresent force, I could point to specific assumptions, practices, and narratives. Future possibilities emerged around redefining success, protecting creativity, creating space for experimentation, and valuing learning rather than only outcomes. Agency remained consistently high throughout this stage, but hope showed its first significant recovery. For the first time, constraints appeared navigable.

The Phoenix smiled.

Fourth Rune: Confronting the Paradox (Worldview)

Here, attention shifted from systems to beliefs. Questions emerged regarding my own complicity within the structures I was critiquing. How far could I push boundaries whilst remaining within the system? Was I genuinely challenging dominant narratives or merely adapting to them more creatively? Where was the distinction between resistance and compliance?

This stage produced another fluctuation. Both hope and agency declined when considering present realities. Future possibilities remained compelling, but immediate constraints felt more tangible. The paradox at the heart of the study became increasingly visible: I felt capable of imagining alternatives whilst simultaneously recognising the limitations surrounding their implementation. Yet amidst this tension one of the study's most important findings emerged. The notion of creating protected creative space, building Futures capabilities, and cultivating a "manifesto for realistic cultural resistance" emerged directly from this stage of analysis. Interestingly, I felt highly agentic regarding my ability to create

such a programme, but much less hopeful regarding whether institutions would embrace it. Agency and hope were clearly not the same phenomenon.

The Phoenix's outline was beginning to blur.

Fifth Rune: A Shift in Identity (Myth and Metaphor)

Here the focus moved beyond structures and beliefs to the stories underpinning them. Two metaphors proved particularly revealing: *"All it takes is one person to start rocking the boat." "Rules and frameworks give a skeleton, but like bones they can be broken."*

This stage produced the highest levels of agency recorded during the Labyrinth. Importantly, this was not because constraints had disappeared. Rather, my relationship with them had changed. Earlier reflections positioned me as someone constrained by systems. By this stage, I increasingly saw myself as someone capable of influencing, navigating, and occasionally disrupting those systems. Hope also increased, though less dramatically than agency. The playful metaphor of becoming the "Mary Poppins of non-conformity, disruption and rebellion" may appear humorous, but it represented an important shift in professional identity. Futures methodologies were no longer simply helping me analyse educational systems; they were reshaping how I understood my role within them.

As I finished examining the rune, smoke drifted steadily from the Phoenix.

Final Rune: After the Labyrinth

The final rune again bore the number eleven. My Locus of Control score remained unchanged. The Labyrinth had not altered my fundamental orientation towards personal responsibility and action. I entered and exited the process with the same internal locus of control. Yet something *had* clearly changed. The qualitative data suggested that agency had evolved rather than increased. I no longer framed agency primarily as overcoming barriers. Instead, I began viewing it as the ability to acknowledge constraints, work creatively within them, and identify opportunities for strategic intervention. Constraints became contextual realities rather than absolute obstacles. Hope, meanwhile, remained more fragile.

Looking up from the final rune, I noticed that the Phoenix was now almost translucent.

The Salient Finding: Hope and Agency are not the Same

As the Phoenix entered its final transformation, the central finding of the study came into focus.

The Labyrinth did not leave me convinced that systemic change was inevitable. If anything, it deepened my awareness of how embedded neoliberal assumptions are within educational structures. What changed was my belief that action remained possible despite that reality. Futures methodologies strengthened my confidence in acting without necessarily increasing confidence that systems would change. Across every stage of the adventure, hope and agency behaved differently. Sometimes agency increased while hope declined. Sometimes hope recovered while agency remained stable. Their relationship was dynamic rather than linear.

The study therefore suggests that engagement with Futures methodologies does not necessarily make participants more hopeful. Instead, it makes constraints more visible. However, this visibility can also strengthen agency by helping participants identify where intervention, imagination, and action remain possible. In other words, Futures methodologies did not remove the storm. They taught me how to navigate within it.

As the last traces of smoke dispersed and the Phoenix vanished from view, I found myself alone with the runes gathered throughout the Labyrinth. The storm had passed overhead, although dark clouds still lingered on distant horizons. Scattered between the stones were crimson feathers, remnants of a companion who had guided me through the inquiry, but whose departure now seemed significant. The Phoenix had never been the source of agency. Rather, it had represented the possibility of agency, the transformative promise frequently attributed to Futures methodologies themselves. Its disappearance invited a different task: not the collection of further insights, but critical reflection upon what had already emerged.

Discussion and Recommendations

Returning to the research question (Fig.1) I found myself revisiting both the literature and the data simultaneously. Rather than producing a single answer, the inquiry generated a collection of overlapping themes, tensions, and images which together revealed a more nuanced picture of Futures practice within Scottish Further Education.

The Storm Was Real: Constraints, Neoliberal Narratives, and False Agency

My experiences during the CLA process repeatedly highlighted the influence of accountability cultures, performativity, resource constraints, and measurement-driven decision-making. Phrases encountered during the Litany and Systemic Causes stages echoed the concerns raised by Ball (2016), Biesta (2017), Brown (2021), and De Lissovoy (2018): that organisational narratives often positioned success as compliance with targets and performance indicators rather than pursuits of educational purpose. Importantly, the findings aligned with existing critiques suggesting that neoliberalism operates not only through formal structures but through assumptions that become normalised and internalised. My own data revealed how frequently ideas became constrained before implementation through narratives such as “that's above my pay grade” or “if it's not in the strategy, we can't do it.” These findings support literature suggesting that organisational narratives actively shape perceptions of what is possible, permissible, and worthwhile. Yet the findings also extend this scholarship. The CLA process demonstrated that naming these narratives matters. While identifying systemic constraints initially reduced my sense of hope, it simultaneously enabled deeper understanding of where those constraints resided. The storm became less mysterious once its source could be located.

Caged Wings: Futures Methods as Both Liberatory and Reproductive

Literature suggested that Futures methodologies contain significant emancipatory potential whilst simultaneously carrying the risk of co-option (Damhof & Gulmans, 2023; Milojević & Inayatullah, 2015; Ross, 2022). My findings strongly support this tension, for throughout the Labyrinth, Futures methods certainly expanded imagination, encouraged reflexivity, and surfaced dominant assumptions. However, they did not automatically generate transformation, though there were moments where engagement with Futures methodologies heightened awareness of limitations without offering immediate solutions.

The caged bird that appeared symbolically throughout the journey therefore became a useful metaphor for understanding the findings. Just as a Phoenix can be admired while remaining imprisoned, Futures methodologies can be celebrated while being subsumed into existing organisational logics. Innovation can become another performance measure. Creativity can become another target. Futures thinking can become another strategic planning exercise. The data repeatedly pointed toward the same conclusion reached by several authors in the literature: methods themselves are not inherently disruptive. Rather, their impact depends on the intentions, values, and contexts surrounding their use. This finding ultimately led to what I describe as the study's central contribution: the productive paradox.

From Navigating Constraints to Architecting Resistance

One of the most surprising findings was that my measured Locus of Control remained unchanged. Despite six weeks of structured engagement with Futures methodologies, I entered and exited the study with the same internal orientation. At first glance, this might suggest that little changed. However, the qualitative findings tell a different story. What evolved was not whether I believed I could act, but how I understood action itself. At the beginning of the study, much of my reflection centred upon navigating constraints. By the end, my language increasingly focused upon experimentation, strategic action, and what I came to term *architecting resistance*. The distinction is important. Rather than viewing agency as overcoming systems, I began to see it as identifying opportunities to act creatively and purposefully within them. This finding aligns with theorists such as Bandura (2005) and Lehtonen et al. (2022), who argue that agency emerges through interactions with social structures rather than independently of them. The metaphor of the rune proved useful here. Individually, each stone represented only a fragment of the experience. Together, however, they formed a pathway. Similarly, no single act of resistance appeared sufficient to transform educational systems. Yet small actions, habits, and interventions created possibilities for cumulative change.

Hope Is Not the Same as Agency

Perhaps the most significant finding concerns the relationship between hope and agency. Prior to this study, I had largely assumed that the two moved together however the findings challenge that assumption. Throughout the CLA process, there were moments where understanding systemic constraints reduced hope whilst simultaneously increasing agency. There were other moments where hopeful possibilities emerged without corresponding increases in confidence that those possibilities would be realised. Hope and agency fluctuated independently. This observation resonates with contemporary scholarship suggesting that hope operates as a dynamic and relational phenomenon rather than a simple emotional state (Colla et al., 2022; Ringel, 2021; Snyder, 2002). Futures methodologies did not leave me feeling more optimistic in any simplistic sense. Instead, they enabled a more grounded and critical form of hope; one capable of acknowledging constraints whilst still imagining alternatives. In retrospect, the Phoenix itself was a manifestation of this distinction. It represented hope throughout the journey, yet its disappearance coincided with stronger expressions of agency. Hope illuminated the path, but agency required walking it.

Recommendations: Creating Space for Responsible Resistance

The findings suggest several implications for Futures practice within Scottish Further Education. First, Futures methodologies should explicitly acknowledge organisational

constraints rather than avoiding them. Naming dominant narratives, power dynamics, and experiences of false agency appears essential if Futures work is to avoid becoming another performative activity.

Second, creativity, experimentation, and protected reflective time should be treated as essential organisational capabilities rather than optional luxuries. Across the study, imagination emerged repeatedly as a precursor to agency, yet many of the narratives encountered positioned creativity as secondary to measurable outputs.

Third, there appears to be value in developing structured opportunities for staff to build Futures capabilities. The proposed "What If?" training module emerged repeatedly throughout the inquiry as a possible vehicle for cultivating futures literacy, narrative awareness, creative confidence, and practical strategies for navigating organisational constraints. Such an intervention would need to avoid promising empowerment whilst ignoring systemic realities. Instead, it could focus upon what I have termed a *"Manifesto for Responsible Resistance*": an approach that encourages experimentation, reflexivity, imagination, and collective action whilst acknowledging the realities of operating within measured systems.

Conclusion: Looking Beyond the Storm

Viewed collectively, the findings from this study suggest that Futures methodologies are neither the heroic solution imagined by their advocates nor merely another instrument of performativity as feared by their critics. Instead, they amplify assumptions, narratives, intentions, hopes, frustrations, and possibilities. They illuminate the storms people inhabit without necessarily dispersing them. They reveal cages and, at the same time, remind us that wings are still possible. The feathers scattered throughout this inquiry ultimately pointed toward a conclusion that is both hopeful and cautionary. Futures methodologies possess emancipatory potential, but that potential is contingent rather than guaranteed. Transformation does not reside within the methods themselves. It emerges through the ways they are enacted, interpreted, and connected to practice.

The storm remains.

The difference is that we can now see more clearly how it is formed, where it gathers strength, and where there may still be opportunities to fly.

Author's Note

This report adopts a reflexive autoethnographic approach utilising artistic license. Some narrative concepts may bear a likeness to those in a well-known fictional series, however these have been utilised purely as tools, devices, and as vehicles for scholarly concepts within the narrative structure of this paper.

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

The author declares that Grammarly, an AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from Grammarly, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Adkins, S. D. H., & Hughes, S. (2020). Back to the Future of Autoethnography. *Journal of Autoethnography*, *1*(3), 297–303.

Ahlqvist, T., & Rhisiart, M. (2015). Emerging pathways for critical futures research: Changing contexts and impacts of social theory. *Futures*, *71*, 91–104.

Ball, S. J. (2016). Neoliberal education? Confronting the slouching beast. *Policy Futures in Education*, *14*(8), 1046–1059. https://doi.org/10.1177/1478210316664259

Bandura, A. (2005). Social cognitive theory: An agentic perspective. *Psychology: The Journal of the Hellenic Psychological Society*, *12*(3), 313–333.

Barrett, F. J., Powley, E. H., & Pearce, B. (2011). Hermeneutic philosophy and organizational theory. In *Philosophy and organization theory* (pp. 181–213). Emerald Group Publishing Limited. https://www.emerald.com/insight/content/doi/10.1108/s0733-558x(2011)0000032009/full/html

Barth, M., & Rieckmann, M. (2012). Academic staff development as a catalyst for curriculum change towards education for sustainable development: An output perspective. *Journal of Cleaner Production*, *26*, 28–36.

Baumeister, R. F., & Alquist, J. L. (2023). The pragmatic structure of indeterminacy: Mapping possibilities as context for action. *Possibility Studies & Society*, *1*(1–2), 15–20. https://doi.org/10.1177/27538699221150777

Biesta, G. (2017). Education, Measurement and the Professions: Reclaiming a space for democratic professionality in education. *Educational Philosophy and Theory*, *49*(4), 315–330. https://doi.org/10.1080/00131857.2015.1048665

Bonal, X. (2003). The Neoliberal Educational Agenda and the Legitimation Crisis: Old and new state strategies. *British Journal of Sociology of Education*, *24*(2), 159–175. https://doi.org/10.1080/01425690301897

Bruner, J. (1998). What is a Narrative Fact? *The ANNALS of the American Academy of Political and Social Science*, *560*(1), 17–27. https://doi.org/10.1177/0002716298560001002

Candy, S., & Dunagan, J. (2017). Designing an experiential scenario: The people who vanished. *Futures*, *86*, 136–153.

Chappell, K., Turner, C., & Wren, H. (2024). *Creative ruptions for emergent educational futures*. Springer Nature. https://library.oapen.org/handle/20.500.12657/92306

Colla, R., Williams, P., Oades, L. G., & Camacho-Morles, J. (2022). “A New Hope” for positive psychology: A dynamic systems reconceptualization of hope theory. *Frontiers in Psychology*, *13*, 809053.

Damhof, L., & Gulmans, J. (2023). Imagining the impossible: An act of radical hope. *Possibility Studies & Society*, *1*(1–2), 51–55. https://doi.org/10.1177/27538699231174821

De Lissovoy, N. (2018). Pedagogy of the anxious: Rethinking critical pedagogy in the context of neoliberal autonomy and responsibilization. *Journal of Education Policy*, *33*(2), 187–205. https://doi.org/10.1080/02680939.2017.1352031

Dunne, A., & Raby, F. (2013). *Speculative Everything, With a new preface by the authors: Design, Fiction, and Social Dreaming*. MIT press. https://books.google.com/books?hl=en&lr=&id=RKzIEAAAQBAJ&oi=fnd&pg=PR7&dq=speculative+everything&ots=_Uprz_3aTt&sig=XdociDtzDyFz_9sXMgYxiBuAL-4

Ellis, C., Adams, T. E., & Bochner, A. P. (2011). Autoethnography: An overview. *Historical Social Research/Historische Sozialforschung*, 273–290.

Frank, A. W. (2002). Why Study People's Stories? The Dialogical Ethics of Narrative Analysis. *International Journal of Qualitative Methods*, *1*(1), 109–117. https://doi.org/10.1177/160940690200100102

Geanellos, R. (2000). Exploring Ricoeur's hermeneutic theory of interpretation as a method of analysing research texts. *Nursing Inquiry*, *7*(2), 112–119. https://doi.org/10.1046/j.1440-1800.2000.00062.x

Glaveanu, V., Lubart, T., Bonnardel, N., Botella, M., De Biaisi, P.-M., Desainte-Catherine, M., Georgsdottir, A., Guillou, K., Kurtag, G., & Mouchiroud, C. (2013). Creativity as action: Findings from five creative domains. *Frontiers in Psychology*, *4*, 40417.

Hicks, D. (2012). The future only arrives when things look dangerous: Reflections on futures education in the UK. *Futures*, *44*(1), 4–13.

Hughes, S., & Pennington, J. (2017). The possibility of autoethnography as critically reflexive action research. In The Possibility of Autoethnography as Critically Reflexive Action Research (pp. 144–167). SAGE Publications, Inc, https://doi.org/10.4135/9781483398594. (n.d.).

Inayatullah, S. (1990). Deconstructing and reconstructing the future: Predictive, cultural and critical epistemologies. *Futures*, *22*(2), 115–141. https://doi.org/10.1016/0016-3287(90)90077-U

Inayatullah, S. (1998). Causal layered analysis: Poststructuralism as method. *Futures*, *30*(8), 815–829.

Inayatullah, S. (2008). Six pillars: Futures thinking for transforming. *Foresight*, *10*(1), 4–21.

Inayatullah, S. (2023). The Futures Triangle: Origins and Iterations. *World Futures Review*, *15*(2–4), 112–121. https://doi.org/10.1177/19467567231203162

Karaiskou, V. (2024). Visual Literacy as a tool to explore what lays behind and beyond our anticipations. *Futures*, *158*, 103350.

Keleş, U. (2022). Writing a "good" autoethnography in educational research: A modest proposal. *The Qualitative Report*, *27*(9), 2026–2046.

Lehtonen, M. J., Yeow, P., & Chew, J. (2022). Empowering change for future-making: Developing agency by framing wicked problems through design. *Futures*, *139*, 102952. https://doi.org/10.1016/j.futures.2022.102952

Mangnus, A. C., Oomen, J., Vervoort, J. M., & Hajer, M. A. (2021). Futures literacy and the diversity of the future. *Futures*, *132*, 102793.

Manolchev, C. (2020). Sensemaking as 'Self'-defence: Investigating spaces of resistance in precarious work. *Competition & Change*, *24*(2), 154–177. https://doi.org/10.1177/1024529418822920

Mao, J., Romero-Hall, E., & Reeves, T. C. (2024). Autoethnography as a research method for educational technology: A reflective discourse. *Educational Technology Research and Development*, *72*(5), 2725–2741.

Mason, J. (2011). Facet Methodology: The Case for an Inventive Research Orientation. *Methodological Innovations Online*, *6*(3), 75–92. https://doi.org/10.4256/mio.2011.008

Meretoja, H. (2023). Expanding our sense of the possible: Ten theses for possibility studies. *Possibility Studies & Society*, *1*(1–2), 137–144. https://doi.org/10.1177/27538699231171448

Miller, R. (2018). Introduction: Futures literacy: transforming the future. In *Transforming the future* (pp. 1–12). Routledge. https://www.taylorfrancis.com/chapters/oa-edit/10.4324/9781351048002-1/introduction-riel-miller

Miller, R., & Sandford, R. (2019). Futures literacy: The capacity to diversify conscious human anticipation. *Handbook of Anticipation*, 73–91.

Milojević, I., & Inayatullah, S. (2015). Narrative foresight. *Futures*, *73*, 151–162. Polkinghorne, 1988.

Ricoeur, P. (1981). *Hermeneutics and the human sciences: Essays on language, action and interpretation*. Cambridge University Press. https://books.google.com/books?hl=en&lr=&id=8L1CwJ0U_DsC&oi=fnd&pg=PP11&dq=hermeneutics+ricoeur&ots=RkktaMJWZL&sig=T_t_Y28XO30LUR0cgnKoVNgN0V0

Ringel, F. (2021). Hope and the future: Temporal agency and the politics of hope in late capitalism. *Environment and Planning D: Society and Space*, *39*(5), 880–886. https://doi.org/10.1177/02637758211052115

Ross, J. (2022). *Digital futures for learning: Speculative methods and pedagogies*. Routledge. https://www.taylorfrancis.com/books/mono/10.4324/9781003202134/digital-futures-learning-jen-ross

Snyder, C. R. (2002). Hope Theory: Rainbows in the Mind. *Psychological Inquiry*, *13*(4), 249–275. https://doi.org/10.1207/S15327965PLI1304_01

Springgay, S., & Truman, S. E. (2018). On the Need for Methods Beyond Proceduralism: Speculative Middles, (In)Tensions, and Response-Ability in Research. *Qualitative Inquiry*, *24*(3), 203–214. https://doi.org/10.1177/1077800417704464

Stutchbury, K. (2022). Critical realism: An explanatory framework for small-scale qualitative studies or an 'unhelpful edifice'? *International Journal of Research & Method in Education*, *45*(2), 113–128. https://doi.org/10.1080/1743727X.2021.1966623

Van Lente, H., & Peters, P. (2022). The future as aesthetic experience: Imagination and engagement in future studies. *European Journal of Futures Research*, *10*(1), 16. https://doi.org/10.1186/s40309-022-00204-8

Weaver, R. G. (1993). *A dynamic model of systems change: The interaction between forces for change and forces for stability*. The Fielding Institute. https://search.proquest.com/openview/b516a407b502ff62f209ca0196c73702/1?pq-origsite=gscholar&cbl=18750&diss=y&casa_token=Z-xj2PjtuG8AAAAA:ezgqDO0tXk-IR2JImcmaXdmmx6XdJRW4cB_CkiBaz5VDC1wmiVgeyuhzVXl7jeCHAKoIi0fv

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (2005). Organizing and the Process of Sensemaking. *Organization Science*, *16*(4), 409–421. https://doi.org/10.1287/orsc.1050.0133

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Constructing Futures: Teacher Trainer Investments and Emotional Entanglements in Exploring GenAI

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Abstract

This narrative inquiry examines how a professional development (PD) facilitator/teacher's evolving engagement with Generative AI (GenAI) for inquiry-based PD is shaped by identity, ideology, and capital, as theorized by investment framework (Darvin & Norton, 2015). Drawing on a longitudinal reflective journal involving field notes and in-depth exploration of emotions, lesson plans, colleague feedback, and the two authors' reflective dialogue, we found four emergent themes: emotions, legitimacy, agency, and role overload. Findings showed that (a) emotions regulated agency and emotional labor was a key part of investment, (b) legitimacy was negotiated through symbolic capital and institutional access to resources and recognition, (c) agency was exerted to enact imagined identities, and (d) role overload constrained investment.

Keywords: GenAI, artificial intelligence, teacher education, professional development, in-service teacher education

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Introduction

This self-narrative aimed to provide an account of a PD facilitator and English language teacher (Author 1) at a Turkish university's Intensive English Program as she undertook efforts to contribute to her institution's adaptation of GenAI and expand her GenAI knowledge for her classroom and research practices. The overarching question for the current inquiry was: *How does a PD facilitator / teacher trainer's investment in GenAI literacy work unfold across time under conditions of shifting educational landscape due to GenAI advancements?*

More specifically, the guiding question was posed under these conditions: The first author's institution aspires to adapt to the advancements in the field of GenAI and she aimed to expand her repertoire as an avid follower of educational technologies, an emerging researcher, and PD facilitator. She undertook a PD initiative and delivered sessions on GenAI tools and inquiry-based means to explore them while actively trying them out in her own classroom. However, this new job and related additional roles influenced emotional trajectories that greatly shaped the way she navigated her responsibilities, and urged a redefinition of her identities. Through collecting detailed narratives of her experiences, this paper seeks to contribute to the evolving scholarship on GenAI in education. It further aims to explore how GenAI practices may reshape future professional responsibilities and perceptions of legitimacy among education stakeholders.

Theoretical Underpinnings

Norton's conceptualization of investment (Darvin & Norton, 2015) is our theoretical foundation. Originally having been coined to investigate the language learning experiences of immigrants (Norton, 1995), the term investment later informed studies from various contexts and situations, including those that explored the changing nature of English in an increasingly digitalized world and teachers' identity formations. Darvin Norton (2015) proposed investment to be at the center of three constructs: ideology, capital and identity. Viewing ideology as part of investment entails deconstruction of power in micro and macro social settings, the positioning of the individuals or groups within each setting, and structuring of habitus (a system with affordances of meaning making). Secondly, capital refers to one's social, cultural and symbolic resources. Darvin and Norton (2015) explicated that symbolic capital is particularly key in the changing world order in which social environments are formed first and foremost through online connections. The value of our resources according to those in power makes them symbolic capital and our symbolic capital enables us to exert agency and choose our investments. Thirdly, Darvin and Norton (2015) posit that identity is multiple, it's a site of struggle, and it continually evolves over time and space.

Considering its components, investment proved to be a valuable lens to look into the first author's experiences as a PD facilitator and English as a Foreign Language (EFL) teacher from a higher education institution: It helped us unpack how her efforts to construct a future for her environment (as a teacher trainer) and herself (as a teacher and researcher) in the era of GenAI. As she strived to achieve this through enhancing her AI literacy and designing a PD course, she also worked towards redefining her professional identities, boosting her symbolic capital by acquiring new knowledge and inquiring her practice for GenAI integration, legitimizing her role as a GenAI-literate teacher trainer in an institution that seeks to reap the benefits of AI as part of its mission and vision.

Method

This qualitative study used a narrative approach (Clandenin and Connelly, 2000) and reported on a longitudinal identity work of the first author with the second author assuming the role of co-inquirer. We drew data from several sources, collected as the first author was piloting GenAI-infused PD and classroom activities:

- An over-six-month reflective journal (December in 2024 to mid-June in 2025) that included field notes and an in-depth report of the narrator's experiences and affective states,
- GenAI-infused lesson plans that involved using AI tools such as ChatGPT, Diffit, Quizlet, Padlet AI, Blooket, Napkin AI, etc, and seeking feedback from the students,
- informal teacher feedback forms collected throughout the piloting of the PD,
- and audio-recorded reflective dialogue of the two authors, which predominantly focused on negotiations over the roles and identities of the first author.

We used thematic analysis to identify the themes (Braun & Clarke, 2006). As a starting point, the first author merged all the data on a single document and coded the recurrent themes inductively in several rounds and had conversations with her custom GPT, which acted as a critical researcher. In the following step, the two authors of this paper discussed the themes in light of the investment theory dimensions.

We gave ethical issues the utmost care during the whole enterprise, the narratives of which we reported here. No identification of teachers and students appears throughout the text. Also, GenAI itself poses clear ethical questions (Pegrum, 2025). Therefore, during the piloting and data collection, ethical concerns were explicitly discussed: Privacy and data safety were cared for, and responsible use of AI was promoted as a matter of principle and emergent needs in the context (Sperling et al., 2024).

Results and Discussion

The data revealed four dominant themes for this self-narrative. Emotion, legitimacy, agency and role overload underlied the narrator's experiences through her investment journey of designing PD, using GenAI productively and enhancing her educational technology use and research skills. We reported each theme separately below by using the third person pronoun (she) in the remaining sections of the paper.

Emotions

Throughout her GenAI journey, the EFL researcher/teacher trainer/teacher focused heavily on her emotions and this led to insights into how emotions shaped agency. Additionally, emotional labor emerged as a significant part of investment. She reported the emotions and affective states of anxiety, exhaustion, frustration, excitement, satisfaction, curiosity, and joy repeatedly. As she described herself as an enthusiastic and ambitious professional, she used these emotions to drive her engagement even though they led to poor wellbeing at times. Undertaking the responsibility of AI amid the other responsibilities provoked a great deal of anxiety particularly due to the fact that it required obtaining technical AI knowledge and synthesizing this knowledge with PD principles, and it involved careful attention to ethical matters. Still, anxiety was conducive to maintaining her agentic work as seen in the below entry: "It's been two days since I finally took action and started watching videos about AI

tools. I thought it is better to take action rather than dread about it… But it is also good to have some anxiety which prompts me to think more." [Sic]

In several instances, she felt exhaustion and frustration when she had little time to focus on her GenAI endeavors due to other responsibilities within the institution. The low interest her students exhibited during her reading class was particularly challenging and caused frustration.

Positive emotions included excitement of upskilling herself with expanding GenAI literacy and use and feeling more competent in the GenAI for education. She felt satisfaction and joy when a PD session and/or a GenAI-enhanced lesson plan went smoothly as these seemingly validated her acquisition of symbolic capital.

Legitimacy

Perceived success of the GenAI initiatives within and beyond the classroom and institutional support to stay on the frontlines of the GenAI evolution at school reinforced the legitimacy of her identity as a trainer/teacher/researcher who productively uses GenAI. Through symbolic capital, the knowledge she built over months and the opportunities she took to join GenAI trainings and events in Istanbul, she was perceived as a legitimate facilitator of the GenAI community in her school.

It was not all external drivers that gave her legitimacy. Through continuous investment to upskill herself in GenAI—the time, money and energy she spent on the courses and trainings—and the inner satisfaction and validation she felt in her interactions with the colleagues from immediate and more distant settings (e.g., colleagues working in other institutions) prompted her to own this legitimacy.

On the other hand, at times she felt her legitimacy was threatened due to externally- and/or internally-rooted influences. When she was treated as an expert and the expectations were too high, she rejected this and voiced her feelings of inadequacy and anxiety: AI is a moving target, and she refused to be treated as if she had figured it all out and had been willing to undertake additional AI projects. She expressed her fear of feeling and being perceived as a fraud who seem to have figured everything out about AI, which seems implausible.

Agency

Several imagined identities and efforts to close the discrepancy between imagined and actual identities propelled her to exert her agency for GenAI upskilling. She imagined her identity to be a teacher training facilitator who learns with other colleagues and leads initiatives as a critical friend in this role, a teacher who guides students for ethical, responsible and effective use of GenAI in language learning studies, a researcher who contributes to the literature of educational studies and practitioner knowledge. These self-assigned imagined identities fueled her agency for action. The journal data and reflective discussions between the authors showed recurrent examples of these identity negotiations and ensuing action-taking. Her agentic moves sought to enhance her symbolic capital and utilize the institutional access and recognition to seek further legitimacy. Additionally, she continued to further refine her imagined identities and future actions, which is exemplified in the excerpt: "I'm even thinking about some 'learn to learn with AI' after school course… to gather some qualitative narrative insights." [Sic]

Role Overload

Her investment into GenAI-related endeavors was seriously challenged several times due to role overload and the feeling of being depleted physically, mentally and emotionally. As she undertook the GenAI teacher training role in her institution, she was also juggling administrative and teaching duties at school, parenting duties at home, and PhD duties whenever and wherever possible. All these were draining her available capital, leaving insufficient resources (e.g., time, energy, creative and critical thinking) for her GenAI investments. She wrote in her journal and mentioned during the reflective discussions with the second author that she was overwhelmed by multiple responsibilities and said her "hands are already full." One instance exemplified her loss of agency and disinvestment as shown in the excerpt: "I was going to join an academic project… Suddenly it became too much. Everything became too much. panicked really bad... I withdrew in the final possible moment." [Sic]

Implications

This paper produced several implications for scholarly work and GenAI initiatives in educational institutions. Firstly, it must be acknowledged that emotions drive teachers' investment in GenAI learning and literacy-building. Normalizing anxiety and building resilience are good strategies in this respect. Secondly, supporting teachers to gain symbolic capital and acknowledging this capital is essential to evolving practice through GenAI. Thirdly, teacher agency can be promoted through sustainable PD activities that encourage teachers to inquiry their practice and to appreciate in what ways GenAI might prove useful to promote student learning and their own PD. Finally, it is important to devise actionable plans that respect multiple responsibilities of teachers and care for teacher wellbeing.

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

Regarding the use of GenAI in the write-up of this paper, the first author created a custom GPT to aid her as a critical friend in conceptualizing this study. Following a long conversation, she mapped the study features: the format, the recurrent and dominant ideas in the data, and how they relate to investment. She sought proofreading and editing in a very limited manner only to check certain phrases and avoided its use as a principle to ensure the presence of the authors' voice. The second author did not consult GenAI at any stage.

References

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Clandinin, D. J., & Connelly, F. M. (2000). *Narrative inquiry: Experience and story in qualitative research*. Jossey-Bass.

Darvin, R., & Norton, B. (2015). Identity and a model of investment in applied linguistics. *Annual Review of Applied Linguistics*, *35*, 36–56.

Norton, B. (2015). Identity, investment, and faces of English internationally. *Chinese Journal of Applied Linguistics, 38*(4). https://doi.org/10.1515/cjal-2015-0025

Pegrum, M. (2025). From revolution to evolution: What generative AI really means for language learning. *Language Teaching*, 1–17.

Peirce, B. N. (1995). Social identity, investment, and language learning. *TESOL Quarterly, 29*(1), 9–31.

Sperling, K., Stenberg, C. J., McGrath, C., Åkerfeldt, A., Heintz, F., & Stenliden, L. (2024). In search of artificial intelligence (AI) literacy in Teacher Education: A scoping review. *Computers and Education Open,* 100169.

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Investigating the Predictability of Factors Affecting the Adoption of Mobile Learning and the Intention to Mobile Learning Acceptance Among Users

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Abstract

The rapid proliferation of mobile devices has prompted educational systems worldwide to explore mobile learning (m-learning) as a means to enable anytime, anywhere individualized education. Understanding the factors influencing the acceptance of such technologies is critical for successful implementation. This study examines the determinants of m-learning acceptance among high school students in Iran, extending the Theory of Planned Behavior (TPB). Data were collected from 318 Iranian high school students and analyzed using structural equation modeling (SEM) in LISREL software. The findings confirmed the significant impact of attitude, subjective norms, and perceived behavioral control on behavioral intention to use m-learning. Contrary to expectations derived from the Technology Acceptance Model (TAM), perceived ease of use and perceived usefulness did not significantly influence attitude toward m-learning. Additionally, the hypothesized effect of learning autonomy on perceived behavioral control was not supported. These results highlight context-specific variations in technology acceptance within non-Western educational settings and suggest that cultural and infrastructural factors may moderate classic acceptance models. The study contributes to the literature on educational technology adoption in developing countries and offers practical implications for policymakers and educators aiming to integrate mobile learning effectively.

Keywords: TPB model, behavioral intention, attitude, mental norms

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Introduction

The education industry has experienced significant growth in the last decades and now has a unique opportunity to create effective learning using mobile learning (M-learning) (Eskandari & Valente, 2022). Researchers concluded that the efficiency of education in the traditional way reaches the highest quantitative and qualitative level when mobile communication technology is used as a supplement or part of combined education (Liu et al., 2022). Also, the high potential of M-learning as an educational tool is seen as the basis for creating a revolution in education (Mohd Razali Abd Samad et al., 2021). Recent advances in the field of communication and wireless technologies have made mobile devices accessible to everyone, facilitating their use and reducing their price.

It is important to note that having mobile devices does not necessarily mean using them in educational fields, as research shows that most students use their mobile phones for communication and pleasure-seeking purposes (Leung, 2020). However, the research has shown that students are interested in using new technologies in education and the reason for this is the diversity and flexibility of M-learning in education (Criollo-C et al., 2021). Therefore, educational institutions should be able to show the advantages of mobile devices for learning to students and provide the necessary conditions for the implementation of M-learning. Of course, the implementation of any system and technology requires knowing the factors influencing its acceptance in the new environment, therefore, to use M-learning as a new stage of electronic learning, the factors influencing its acceptance must be known in order to fully understand it. Its use in educational environments of the country took a step. In this regard, this research question can be raised, which are these factors, and more importantly, what is the degree of predictability of these factors on the intention to accept M-learning?

Literature Review

Basics and Conceptual Framework of Research

Due to insufficient integration of information and communication technologies (ICT) in education, educational systems have not progressed in line with broader technological and social transformations, creating a risk of learner disengagement from formal education (Adekunle Oke & Fernandes, 2020). As a result, education has increasingly incorporated ICT-based approaches such as distance learning, e-learning, and mobile learning (M-learning) to bridge this gap.

M-learning has been defined in multiple ways, reflecting its still-developing nature and the lack of consensus on the concept of “mobile.” Early definitions emphasized mobile technologies, whereas more recent perspectives focus on learner mobility and contextual flexibility in using any available technology (Abdalwali Lutfi et al., 2022). In general, M-learning refers to the use of mobile or wireless devices for learning while learners are mobile (Yang et al., 2021). Broader definitions also include any learning occurring in mobile-supported environments, considering the mobility of both technology and learners (Oliveira et al., 2021). Accordingly, M-learning enables access to educational resources through devices such as smartphones, tablets, and PDAs, allowing learning across time and space (Criollo-C et al., 2021). In this sense, M-learning is often regarded as a subset and extension of e-learning, offering anytime-anywhere learning through mobile communication technologies (Eskandari & Tabibi, 2026).

M-learning represents a significant opportunity for enhancing educational experiences in schools (Alfalah, 2023). Consequently, educational institutions aim to align with rapid ICT developments by adopting these technologies to improve teaching and learning processes. In this context, understanding factors influencing technology acceptance is essential for effective integration. However, research on M-learning adoption using information systems theories remains limited, prompting calls for further studies based on established models (Wang et al., 2022).

Most prior studies have applied the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). In contrast, this study employs the Theory of Planned Behavior (TPB) as its main framework, as it better captures individual-level adoption processes rather than organizational contexts (Dube et al., 2020). Unlike earlier models focusing mainly on system characteristics, TPB allows consideration of users' perceived capabilities, which is particularly relevant for M-learning adoption.

Accordingly, this study examines the relationships between attitude, subjective norms, and perceived behavioral control with behavioral intention toward M-learning. Additionally, perceived ease of use, perceived usefulness, and perceived playfulness are linked to attitude, while teachers' and students' readiness relate to subjective norms. Perceived self-efficacy and learning independence are also considered determinants of perceived behavioral control. The inclusion of perceived playfulness is justified by the inherently interactive and enjoyable nature of mobile devices, which can enhance user motivation and positive attitudes (Abdalwali Lutfi et al., 2022).

In this study, M-learning is defined as any learning activity conducted through mobile devices such as smartphones, tablets, and e-readers, enabling access, sharing, and creation of knowledge anytime and anywhere.

Attitude refers to an individual's positive or negative evaluation of performing a behavior and is influenced by beliefs about its outcomes (Ajzen, 2020). Perceived ease of use reflects the extent to which M-learning is considered effortless, while perceived usefulness refers to its value in facilitating timely access to information (Qashou, 2021). Perceived playfulness includes attention focus, curiosity, and enjoyment during interaction with M-learning systems (Wang et al., 2022).

Subjective norms represent perceived social pressure from important others regarding technology use and are known to significantly influence behavioral intentions (Bagheri et al., 2019; Bhutto et al., 2021). Perceived behavioral control reflects individuals' perceived ability to perform a behavior, including both control over resources and self-confidence (Dar et al., 2022).

This construct is further explained through perceived self-efficacy and learning independence. Self-efficacy refers to confidence in one's ability to perform required actions and has been widely recognized as a predictor of technology adoption (Thongsri et al., 2020). Learning independence reflects self-discipline and responsibility in managing one's learning process (Orakci & Durnali, 2023). This is particularly important in M-learning contexts, where learners often operate independently from instructors and peers (Alamer & Al Khateeb, 2023).

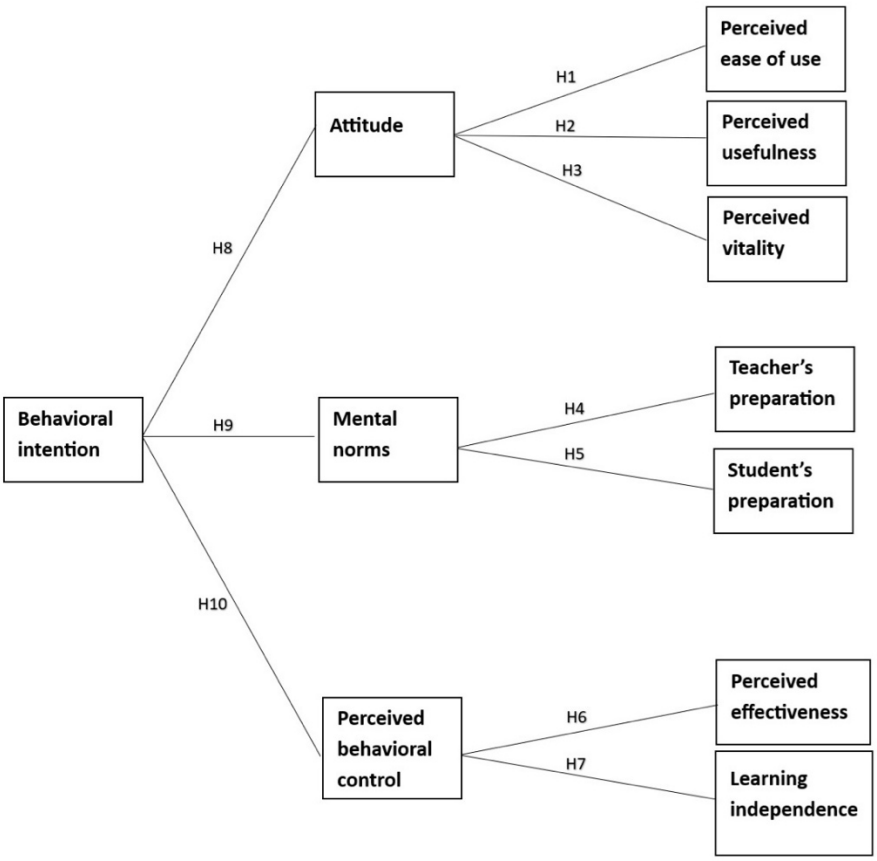
Finally, behavioral intention represents users' tendency to adopt and use technology and is commonly used as a proxy for actual usage in M-learning research (Alfalah, 2023; Qashou,

2021). Therefore, in the present study, due to the impossibility of investigating the actual use of the behavioral intention variable, it is used to predict the acceptance of M-learning.

Theoretical Framework and Research Hypotheses

In Figure 1, the conceptual model and the relationships between the research's variables have been made according to the definitions, the introduced variables and the background of the research are shown in the form of ten hypotheses with the symbols H1 to H10.

Figure 1
Conceptual Model of Research



Methodology

This research is applied in terms of purpose and descriptive-analytical in terms of method. The research was conducted through international collaboration: data collection took place in Iran via local researchers and schools, while data analysis was handled by the authors affiliated with institutions in Spain and the United States. To collect data, a questionnaire (Cheon et al., 2012) was used in the field of M-learning acceptance, and for the items related to perceived vitality variable, a questionnaire (Moon & Kim, 2001) was used. The final questionnaire includes 7 questions about demographic information and 37 main items in the form of a five-point Likert scale. The study population of this research was high school students in Iran, and high schools in Tehran were selected as available samples. Since the principles of determining the sample size in multivariate regression analysis are also true for determining the sample size in structural equation modeling, the following formula can be used to determine the minimum number of samples (1) (Wolf et al., 2016).

$$5q \leq n \leq 15q \quad (1)$$

(Where q is the number of observed variables [questionnaire items] and n is the sample size.)

Some other researchers suggest a minimum sample size of 200 to perform structural equations. According to the 37 items of the questionnaire and the minimum sample size of 200, in this research, 318 people were finally selected as the study sample, and in order to analyze the data, the structural equation modeling method was used with Lisrel 8.71 software.

In order to confirm validity, two methods of content validity and structure validity have been used. Obtaining the opinions of supervisors, advisors and four management experts confirmed content validity, and construct validity was used in the form of determining convergent and divergent validity. Convergent validity was confirmed by using confirmatory factor analysis in such a way that the factor loadings related to the questionnaire questions were higher than 0.5 and the average value of Average Variance Extracted (AVE) was higher than 0.5. Table 1 shows the results of convergent validity analysis.

Table 1

The Results of Factor Loadings and Average Variance Extracted

Variable	AVE	Item	Factor loadings	Variable	AVE	Item	Factor loadings
Perceived ease of use	0.58	Q1	0.57	Perceived effectiveness	0.60	Q20	0.74
		Q2	0.54			Q21	0.77
		Q3	0.84			Q22	0.80
Perceived usefulness	0.61	Q4	0.72	Learning independence	0.60	Q23	0.63
		Q5	0.59			Q24	0.79
Perceived vitality	0.57	Q6	0.77			Q25	0.69
		Q7	0.54	Attitude	0.69	Q26	0.80
		Q8	0.55			Q27	0.80
		Q9	0.78			Q28	0.69
		Q10	0.57	Mental norms	0.64	Q29	0.75
		Q11	0.63			Q30	0.68
		Q12	0.57			Q31	0.76
Teacher's preparation	0.62	Q13	0.76	Perceived behavioral control	0.63	Q32	0.64
		Q14	0.78			Q33	0.71
		Q15	0.83			Q34	0.77
		Q16	0.56	Intention to acceptance M- learning	0.69	Q35	0.81
Student's preparation	0.63	Q17	0.76			Q36	0.79
		Q18	0.86			Q37	0.82
		Q19	0.58				

For divergent validity, the questions that measure one variable should have a high correlation with the target variable and a low correlation with the other variable. For this purpose, the root mean square of the extracted variance of the variable was compared with the correlation values that this variable has with other variable variables, and the root mean square of the extracted variance was greater than the correlation values, which confirms the divergent validity (Rönkkö & Cho, 2022). Table 2 shows the results of divergent validity analysis.

Table 2
The Pearson's Correlation Matrix and Root Mean Square Variance Extraction

Concept	1	2	3	4	5	6	7	8	9	10	11
Perceived ease of use	0.762										
Perceived usefulness	0.546**	0.781									
Perceived vitality	0.376**	0.472**	0.755								
Teacher's preparation	0.173**	0.194**	0.316**	0.787							
Student's preparation	0.348**	0.282**	0.294**	0.345**	0.794						
Perceived effectiveness	0.410**	0.487**	0.429**	0.189**	0.465**	0.812					
Learning independence	0.480**	0.535**	0.519**	0.330**	0.433**	0.568**	0.775				
Attitude	0.364**	0.497**	0.520**	0.374**	0.411**	0.628**	0.556**	0.831			
Mental norms	0.355**	0.421**	0.360**	0.364**	0.499**	0.405**	0.506**	0.529**	0.800		
Perceived behavioral control	0.334**	0.388**	0.392**	0.149**	0.410**	0.618**	0.479**	0.447**	0.392**	0.794	
Behavioral intention	0.394**	0.450**	0.394**	0.225**	0.426**	0.527**	0.458**	0.558**	0.433**	0.429**	0.831

Cronbach's alpha coefficient was also used to measure the reliability of the questionnaire. The results related to the reliability of each research variable are presented in Table 3. According to the results of the calculated coefficients, the reliability of the questionnaire was also confirmed.

Table 3
The Cronbach's Alpha Coefficient of Research Variables

Concept	*Item No.*	*Cronbach's alpha coefficient*
Perceived ease of use	3	0.655
Perceived usefulness	3	0.720
Perceived vitality	7	0.713
Teacher's preparation	3	0.713
Student's preparation	3	0.716
Perceived effectiveness	3	0.816
Learning independence	3	0.735
Attitude	3	0.803
Mental norms	3	0.771
Perceived behavioral control	3	0.752
Behavioral intention	3	0.854

Findings and Discussion

Tables 4 and 5 show descriptive findings related to demographic characteristics and research variables, respectively.

Table 4
The Descriptive Results of Demographic Findings

Demographic categories	*Range*	*Frequency*	*Percentage*
Gender	Female	168	52.8
	Male	150	47.2
Age	≥20	30	9.4
	21–25	176	55.3
	26–30	96	30.2
	≤31	16	5
Degree of study	Junior	168	52.8
	Senior	150	47.2
Discipline of study	Mathematical & physics	132	41.5
	Experimental science	36	11.3
	Humanities	150	47.2
Mobile devices	Cellular phone	107	32.7
	Smart phone	268	79.6
	Tablet	73	23
	Digital book reader	3	0.9
Mobile operators	MCI	219	68.9
	MTN Irancell	163	51.3
	RighTel	26	8.2
	Taliya	2	0.6
Using the Internet with a mobile device	Yes	275	86.5
	No	43	13.5
How to connect to the Internet	GPRS	53	16.7
	WiFi	222	69.8

Table 5
The Descriptive Indices for Research Variables

Concept	*Mean*	*Standard Deviation*	*Skewness*	*Kurtosis*
Perceived ease of use	4.0199	0.62707	-0.478	0.723
Perceived usefulness	4.0136	0.63942	-0.504	0.289
Perceived vitality	3.7062	0.5792	-0.171	0.117
Teacher's preparation	3.2369	0.77495	-0.338	-0.077
Student's preparation	3.7182	0.68009	-0.339	0.353
Perceived effectiveness	3.8623	0.81797	-0.765	0.374
Learning independence	3.6898	0.72247	-0.309	0.342
Attitude	3.6751	0.7893	-0.531	0.393
Mental norms	3.6088	0.71489	-0.362	0.105
Perceived behavioral control	4.0999	0.64809	-0.313	-0.428
Behavioral intention	4.0221	0.75929	-0.803	0.975

Fit of the Research Model

In the confirmatory factor analysis, the measurement tool was confirmed according to the obtained coefficients. In this part, the results of fitting the research model, as shown in Figure 2 and Table 6, indicate the approval of the model in terms of fit indices. Therefore, it is possible to depict the results of hypothesis testing according to the findings obtained through path analysis.

Figure 2
The Research Model in the Estimation Mode of Standard Coefficients and the Significance Mode of T Coefficients

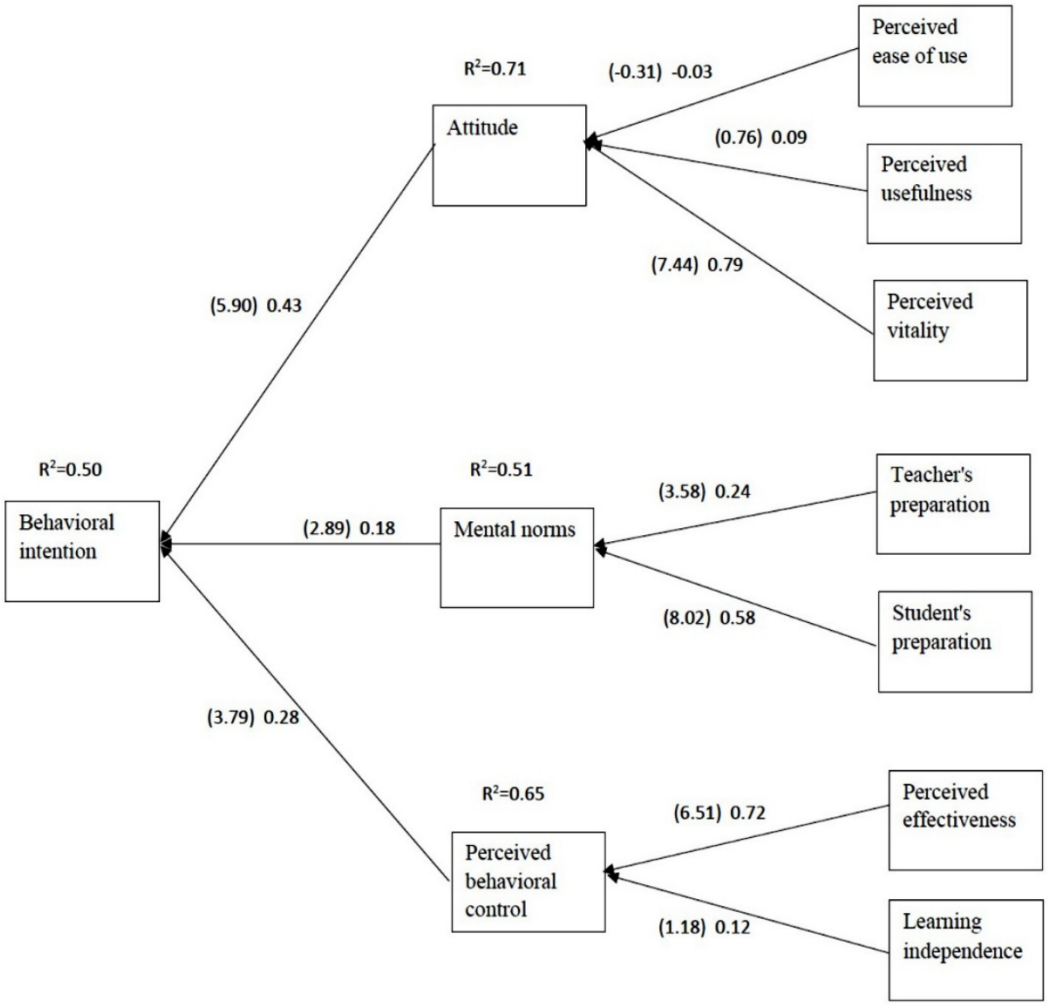


Table 6
The Model Fit Indices and Obtained Values

Indices	*Model estimates*	*Allowed limit*
Chi-square distribution	2.048	> 3
GFI	0.83	< 0.80
AGFI	0.81	< 0.80
RMSEA	0.057	> 0.090
CFI	0.96	< 0.90
NFI	0.92	< 0.90
NNFI	0.95	< 0.90
IFI	0.95	< 0.90

In figure number 2, the outputs of the path analysis show the research model in two modes of estimation of standard coefficients and significance mode. The research model shows the factor loadings and path coefficients in the estimation mode of the standard coefficients, and in the t coefficients or significance mode, it shows the values of the t statistic, which are used to judge the significance of the relationships.

Table 7 shows the results of the test of ten hypotheses in a summary form.

Table 7
The Path Coefficient, T-Statistic, Coefficient of Determination (COD) and the Result of Research Hypotheses

Research hypotheses	path coefficient	T-statistic	COD	Sig.	Result
Perceived ease of use→ Attitude	-0.03	-0.31	0.71	P > 0 .05	Reject
Perceived usefulness→ Attitude	0.09	0.76		P > 0 .05	Reject
Perceived vitality→ Attitude	0.79	7.44		P < 0.01	Confirm
Teacher's preparation→ Mental norms	0.24	3.58	0.51	P < 0.01	Confirm
Student's preparation→ Mental norms	0.58	8.02		P < 0.01	Confirm
Perceived effectiveness→ Perceived usefulness	0.72	6.51	0.65	P < 0.01	Confirm
Learning independence→ Perceived usefulness	0.12	1.18		P > 0.05	Reject
Attitude→ Intention to acceptance mobile learning	0.43	5.90	0.50	P < 0.01	Confirm
Mental norms→ Behavioral intention	0.18	2.89		P < 0.01	Confirm
Perceived behavioral control→ Behavioral intention	0.28	3.79		P < 0 .01	Confirm

As shown, seven of the ten hypotheses were supported, while three were rejected. The results indicated that perceived ease of use and perceived usefulness did not have a significant effect on attitude toward M-learning (H1 and H2 rejected). In contrast, perceived vitality had a significant positive impact on attitude. Both teachers' preparation and students' preparation showed significant positive effects on mental norms. Perceived effectiveness was found to positively influence perceived behavioral control, whereas learning independence did not show a significant effect. Finally, attitude, mental norms, and perceived behavioral control all demonstrated significant positive relationships with behavioral intention to use M-learning.

Conclusion

The purpose of this research was to introduce and determine the intensity of factors influencing the acceptance of M-learning and identify the type of relationships between these factors. Data analysis showed that the three main variables of the TPB model (attitude, mental norms and perceived behavioral control) have a positive and significant relationship with students' behavioral intention to accept M-learning and are considered suitable predictors for it. Meanwhile, attitude has the most effect with a path coefficient of 0.43, followed by perceived behavioral control with a path coefficient of 0.28 and mental norms with a path coefficient of 0.18. The reason for this could be the reduction of the influence of others' views on students' performance/non-performance of certain behavior. Also, the model used in this research showed that 50% of the variance of behavioral intention to accept M-learning ($R^2 = 0.50$) was influenced by three factors of attitude, mental norms and perceived behavioral control. This shows the high predictability of the model in the studied society.

Despite the non-significance of the two variables perceived ease of use and perceived usefulness, perceived vitality as a predictor of the attitude variable has the greatest effect on attitude with a path coefficient of 0.79. The studied sample shows that 79.6 percent of the students use smart phones and all of them use mobile devices, this shows that in their opinion the perceived ease of use is no longer considered as a predictor of attitude and behavioral intention. Also, due to the fun and enjoyable aspects of M-learning, perceived usefulness has lost its predictability in favor of perceived vitality. Of course, this issue does not hide the importance of these two factors, and for the implementation of M-learning, usefulness and ease of use should be considered as effective factors in the design and construction of software, interface and educational materials. Also, 71% of the attitude variance highlights the need to pay attention to the aforementioned variables.

On the other hand, it was found that the preparation of teachers and the preparation of students have a positive and significant effect on mental norms, with the explanation that the preparation of students with a path coefficient of 0.58 is more than the preparation of teachers with a path coefficient of 0.24. This shows that students are more influenced by their peers to use M-learning. This shows that students believe that teachers are less prepared than students to use M-learning. In addition, it should be noted that the two variables of teachers' and students' preparation explain 51% of the variance of mental norms.

Finally, the results of data analysis regarding the effect of the perceived self-efficacy variable on the perceived behavioral control variable were also positive and significant, but the effect of the learning independence variable on the perceived behavioral control variable was not confirmed. There is a belief that the traditional methods of teaching and teacher-centered in traditional curricula have caused students to have less choice in choosing learning resources and activities. Therefore, the lack of self-confidence necessary to create knowledge and control the speed of learning by students and relying on teachers' opinions and beliefs in each part of learning can be considered as among the inhibiting factors in predicting the behavioral control variable perceived by learning independence. It should be noted that the two variables of perceived self-efficacy and learning independence explain 65% of the variance of perceived behavioral control, which is a significant amount.

Suggestions

Although mental norms had the least effect on behavioral intention in this research. But this finding showed that from the perspective of students, teachers are less prepared to use M-learning. Since this issue shows the importance of the role of teachers in accepting M-learning by students; therefore, it is suggested that schools prepare teachers for the implementation of M-learning systems in schools with various organizational supports such as technical support and professional development.

The high percentage of using smart phones in the studied sample (close to 80%) and all of them using mobile devices can be considered as a sign of changing the teaching style and diversifying it by the teachers. Therefore, in addition to revising the programs and curriculum content, special attention should be paid to the diversification of teaching methods by the policy makers in the educational field. Considering the effect of perceived self-efficacy on perceived behavioral control by students, it is necessary for students to consider the use of mobile devices as an opportunity for learning and if there are no suitable conditions in the educational environment, such a task for define themselves.

In conclusion, it should be noted that the model used in this research was the developed TPB model and the results showed that based on this model, 50% of the variance of M-learning acceptance can be explained by the factors of this model. Future researches can examine other models of technology acceptance to examine the acceptance of M-learning and compare the results with the current research model so that the most suitable model is the basis for future researches. In addition, the data of this research has been collected cross-sectionally, while the perception of people changes with the passage of time, education and experience. As a result, it is better for future researches to use longitudinal methods to obtain data so that they can better understand the state of M-learning acceptance and identify the influencing variables more accurately.

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

The authors declare that ChatGPT (OpenAI), an AI-assisted writing tool, was used to support English language refinement and structural editing of the manuscript. The use was limited to improving clarity, coherence, and academic phrasing. The ideas, design, procedures, findings, analyses, and discussion are based on the authors' research activities and project documentation, and the authors reviewed and finalized all content.

References

Abdalwali Lutfi, A., Saad, M., Almaiah, M. A., Alsaad, A., Al-Khasawneh, A., Alrawad, M., Alsyouf, A., & Al-Khasawneh, A. L. (2022). Actual use of mobile learning technologies during social distancing circumstances: Case study of King Faisal University students. *Sustainability, 14*(12), 7358. https://doi.org/10.3390/su14127358

Adekunle Oke, A., & Fernandes, F. A. P. (2020). Innovations in teaching and learning: Exploring the perceptions of the education sector on the 4th Industrial Revolution (4IR). *Journal of Open Innovation: Technology, Market, and Complexity, 6*(2), 31. https://doi.org/10.3390/joitmc6020031

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human Behavior and Emerging Technologies, 2*(4), 314–324. https://doi.org/10.1002/hbe2.195

Alfalah, A. A. (2023). Factors influencing students' adoption and use of mobile learning management systems (m-LMSs): A quantitative study of Saudi Arabia. *International Journal of Information Management Data Insights, 3*(1), 100143. https://doi.org/10.1016/j.jjimei.2023.100143

Bagheri, A., Bondori, A., Allahyari, M. S., & Damalas, C. A. (2019). Modeling farmers' intention to use pesticides: An expanded version of the theory of planned behavior. *Journal of Environmental Management, 248*, 109291. https://doi.org/10.1016/j.jenvman.2019.109291

Bhutto, M. Y., Liu, X., Soomro, Y. A., Ertz, M., & Baeshen, Y. (2021). Adoption of energy-efficient home appliances: Extending the theory of planned behavior. *Sustainability, 13*(1), 250. https://doi.org/10.3390/su13010250

Cheon, J., Lee, S., Crooks, S. M., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Computers & Education, 59*(3), 1054–1064. https://doi.org/10.1016/j.compedu.2012.04.015

Criollo-C, S., Guerrero-Arias, A., Jaramillo-Alcázar, Á., & Luján-Mora, S. (2021). Mobile learning technologies for education: Benefits and pending issues. *Applied Sciences, 11*(9), 4111. https://doi.org/10.3390/app11094111

Dar, N., Ahmad, S., & Rahman, W. (2022). How and when overqualification improves innovative work behaviour: The roles of creative self-confidence and psychological safety. *Personnel Review, 51*(9), 2461–2481. https://doi.org/10.1108/PR-06-2021-0404

Dube, T., van Eck, R., & Zuva, T. (2020). Review of technology adoption models and theories to measure readiness and acceptable use of technology in a business organization. *Journal of Information Technology and Digital World, 2*(3), 207–212. https://doi.org/10.1007/s10639-020-10323-z

Eskandari, S., & Tabibi, A. (2026). Evaluation of mobile learning acceptance among users in Iran using the technology acceptance model (TAM). *INTED2026 Proceedings*, Article 0246. https://doi.org/10.21125/inted.2026.0246

Eskandari, S., & Valente, J. P. (2022). An extended technology acceptance model in the context of mobile learning for primary school students. In M. E. Auer & T. Tsiatsos (Eds.), *New realities, mobile systems and applications: IMCL 2021*. *Lecture Notes in Networks and Systems* (Vol. 411, pp. 273–285). Springer. https://doi.org/10.1007/978-3-030-96296-8_25

Leung, L. (2020). Exploring the relationship between smartphone activities, flow experience, and boredom in free time. *Computers in Human Behavior, 103*, 130–139. https://doi.org/10.1016/j.chb.2019.08.013

Liu, Z., Rolston, N., Flick, A. C., Colburn, T. W., Ren, Z., Dauskardt, R. H., & Buonassisi, T. (2022). Machine learning with knowledge constraints for process optimization of open-air perovskite solar cell manufacturing. *Joule, 6*(4), 852–865. https://doi.org/10.1016/j.joule.2022.03.004

Mohd Razali Abd Samad, M. R. A., Ihsan, Z. H., & Khalid, F. (2021). The use of mobile learning in teaching and learning session during the Covid-19 pandemic in Malaysia. *Journal of Contemporary Social Science and Education Studies (JOCSSES), 1*(2), 46–65.

Moon, J.-W., & Kim, Y.-G. (2001). Extending the TAM for a world-wide-web context. *Information & Management, 38*(4), 217–230. https://doi.org/10.1016/S0378-7206(00)00061-6

Oliveira, D. M. D., Pedro, L., & Santos, C. (2021). The use of mobile applications in higher education classes: A comparative pilot study of the students' perceptions and real usage. *Smart Learning Environments, 8*, 14. https://doi.org/10.1186/s40561-021-00159-6

Orakci, Ş., & Durnali, M. (2023). The mediating effects of metacognition and creative thinking on the relationship between teachers' autonomy support and teachers' self-efficacy. *Psychology in the Schools, 60*, 162–181. https://doi.org/10.1002/pits.22777

Qashou, A. (2021). Influencing factors in M-learning adoption in higher education. *Education and Information Technologies, 26*, 1755–1785. https://doi.org/10.1007/s10639-020-10323-z

Thongsri, N., Shen, L., & Bao, Y. (2020). Investigating academic major differences in perception of computer self-efficacy and intention toward e-learning adoption in China. *Innovations in Education and Teaching International, 57*(5), 577–589. https://doi.org/10.1080/14703297.2019.1572401

Wang, J., Li, X., Wang, P., Liu, Q., Deng, Z., & Wang, J. (2022). Research trend of the unified theory of acceptance and use of technology: A bibliometric analysis. *Sustainability, 14*(1), 10010. https://doi.org/10.3390/su14010010

Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2016). Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement, 76*(6), 913–934. https://doi.org/10.1177/0013164413495237

Yang, X., Zhao, X., Tian, X., & Xing, B. (2021). Effects of environment and posture on the concentration and achievement of students in mobile learning. *Interactive Learning Environments, 29*(3), 400–413. https://doi.org/10.1080/10494820.2019.1707692

Global Storytelling in Motion: BookTok as a Bridge for Global Literacies and Digital Identity in Teacher Preparation

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Abstract

As literacy practices move across digital and cultural boundaries, preservice teachers must be prepared to select diverse texts and design instruction that reflects the ways contemporary readers encounter and share stories. This exploratory mixed methods study examined how a course embedded BookTok assignment influenced preservice teachers' engagement with multicultural children's literature, digital literacies, global literacies, and developing professional identities. Thirteen preservice teachers completed the assignment, and five voluntarily participated in the research study. Data included Likert scale responses, open ended reflections, and participant generated BookTok videos. Descriptive and thematic analyses revealed purposeful use of digital features to support comprehension and accessibility, increased attention to representation and belonging, and deeper interpretation of selected texts through repeated reading and digital composition. Participants also connected the experience to future literacy instruction while identifying concerns related to access, time, and instructional purpose. Findings suggest that structured digital literacy experiences centered on multicultural literature may help preservice teachers deepen literary understanding, examine representation, and rehearse instructional decision making for globally connected classrooms.

Keywords: BookTok, literacy instruction, teacher preparation, digital literacies, multicultural children's literature, diverse texts

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Introduction

Globalization has fundamentally transformed how individuals communicate, access information, and engage with literacy across cultural and geographic boundaries. Literacy is no longer confined to print based texts or classroom settings. Increasingly, readers create, share, interpret, and respond to texts within connected digital communities (Leu et al., 2019; The New London Group, 1996). These shifts have expanded both where literacy occurs and what it means to be literate in the twenty first century. Today's readers encounter stories and perspectives shaped by experiences beyond their own and participate in digital spaces where texts and conversations move rapidly across borders (Cope & Kalantzis, 2015; UNESCO, 2015).

For teacher education, this changing literacy landscape raises an important question: Are future teachers being prepared for the texts, communities, and ways of communicating their students already encounter? Teachers entering today's classrooms will work with children whose cultural identities, languages, families, and lived experiences may differ significantly from their own. The books placed in those classrooms matter. When students encounter characters and experiences that reflect their own lives, literature can affirm that their stories belong in the classroom. Diverse texts can also introduce students to lives beyond their own and create opportunities for empathy, discussion, and cultural understanding (Bishop, 1990; Gay, 2018).

Preservice teachers must therefore become familiar with multicultural and diverse children's literature before they are responsible for selecting texts for their own students. This familiarity requires more than recognizing the presence of diverse characters. Future teachers need opportunities to read widely, examine representation, consider whose voices are centered, and determine which books may be meaningful for particular learners and classroom communities. Bishop's (1990) description of books as mirrors, windows, and sliding glass doors remains relevant to this work. Children need opportunities to see themselves reflected in literature, but teachers cannot consistently provide those opportunities if their own knowledge of diverse texts is limited.

The ways young readers discover and respond to books are also changing. Children and adolescents increasingly encounter literature through social media, online reading communities, and short form video. Preparing future educators for this environment requires more than teaching them to add technology to an existing lesson. Preservice teachers need opportunities to consider how digital communication, culture, identity, audience, and instructional purpose intersect within literacy education (Jenkins, 2009; Mishra & Koehler, 2006).

Within this landscape, BookTok has emerged as a prominent online community centered on books and reading. As a literature focused community on TikTok, BookTok allows readers, educators, authors, and publishers to recommend books, interpret literary themes, share personal responses, and participate in conversations that extend across national and cultural boundaries (Jerasa et al., 2024). Unlike a traditional written book review, a BookTok video communicates through spoken language, written text, images, music, pacing, captions, and visual design. Meaning is shaped not only by what a creator says about a book, but also by how the book and its message are presented to an audience (Serafini, 2013).

BookTok is particularly interesting for literacy educators because it places reading within a participatory culture. Readers recommend, interpret, respond, create, and invite others into

conversations about texts. Jenkins (2009) describes participatory cultures as spaces in which individuals create and share content while learning through social interaction. Viewed through this lens, BookTok is more than a venue for promoting books. It is a contemporary literacy community where participants make decisions about audience, representation, communication, and identity.

Prior research has begun examining BookTok within teacher education, including how preservice teachers navigate digital design and transfer personal digital practices into imagined classroom instruction (Jerasa et al., 2024). Less attention, however, has been given to what occurs when BookTok assignments are intentionally centered on multicultural children's literature and preservice teachers are asked to consider culture, representation, belonging, and text selection as part of their instructional decision making. This distinction is important. Knowing that diverse books matter is not the same as developing the familiarity and judgment needed to select and teach those books thoughtfully.

When preservice teachers create digital literary content around multicultural children's literature, they must decide what aspects of a text deserve emphasis, which comprehension strategies to model, how digital features may support meaning, and how culture and identity are communicated to an audience. The process also requires them to read, reread, interpret, and consider how children may experience the story. Creating a BookTok video may therefore serve as a form of pedagogical rehearsal in which future teachers practice literacy decisions they will eventually make for students.

The purpose of this study was to examine how participation in a course embedded BookTok assignment influenced preservice teachers' engagement with multicultural literature, digital literacies, global literacies, and professional digital identity within an undergraduate literacy methods course. Thirteen preservice teachers completed the assignment, and five voluntarily consented to participate in the research study. Descriptive quantitative data from Likert scale items were considered alongside open-ended responses and participant generated digital artifacts. The study examined how participants used digital composition to communicate meaning, considered culture and representation in instructional decisions, and reflected on the possibilities and challenges of social media-based literacy practices in future classrooms.

Literature Review

Global Literacies, Diverse Texts, and Teacher Preparation

Digital communication has changed the context in which literacy is practiced. Readers routinely encounter stories, perspectives, and communities that extend beyond geographic and cultural boundaries. Literacy instruction must therefore prepare students to engage with difference, examine perspectives critically, and participate responsibly within connected environments (Leu et al., 2019). UNESCO (2015) similarly positions global citizenship education as preparation for appreciating cultural diversity, communicating across differences, and participating thoughtfully in an interconnected world.

Global literacies recognize that literacy practices are shaped by culture, language, technology, and social context. Reading globally involves more than reading a text from another country. It requires attention to how experiences, identities, and cultural perspectives shape the ways stories are written, interpreted, and shared (Cope & Kalantzis, 2015).

This responsibility has direct implications for teacher preparation. Preservice teachers may enter education programs with limited familiarity with children's literature representing cultures and lived experiences different from their own. Yet, they will eventually select the books students encounter in classrooms. Teachers must learn to examine representation, recognize whose voices are present or absent, and make thoughtful decisions about the texts they place before children.

Bishop's (1990) concept of books as mirrors, windows, and sliding glass doors provides an important foundation for this work. Literature can affirm children's identities while introducing them to experiences beyond their own. Providing those opportunities, however, requires teachers who know diverse literature and understand the cultural and instructional possibilities within those texts.

Digital Literacies and Participatory Culture

Digital literacies involve more than knowing how to operate a device or use an application. They include the knowledge and judgment needed to locate, evaluate, create, and communicate information in digital environments (Leu et al., 2019). Audience, purpose, credibility, accessibility, and communication choices all influence how meaning is created and received.

For preservice teachers, digital composition provides an opportunity to experience these decisions as creators. Adding captions, adjusting pacing, incorporating visual supports, or selecting audio for a literacy activity requires consideration of how an audience may access and understand information. These choices place technology within the larger work of literacy planning rather than treating it as an instructional addition (Mishra & Koehler, 2006).

Jenkins' (2009) concept of participatory culture is also relevant to digital literacy communities such as BookTok. Participants do not simply consume information. They create, share, respond, and contribute to larger conversations. For preservice teachers, creating literacy content for an audience may encourage them to think differently about communication, credibility, accessibility, and instructional purposes.

These experiences may also influence developing professional identity. Gee (2015) argues that identities are shaped through participation in social practices and communities. Preservice teachers are beginning to move from thinking primarily as students toward making decisions as educators. Opportunities to select texts, plan instruction, communicate with an audience, and reflect on those choices may contribute to how future teachers begin to see themselves as literacy educators.

Diverse Texts and Inclusive Literacy Instruction

Children's literature plays an important role in shaping the stories, experiences, and perspectives students encounter in classrooms. Scholarship on culturally relevant and culturally sustaining pedagogy has emphasized how students' experiences, language, and cultural knowledge shape learning (Gay, 2018; Ladson Billings, 1995; Paris, 2012). Within literacy instruction, this scholarship raises important questions about the range of texts available to students and the ways teachers select literature for classroom use.

Diverse children's literature can provide opportunities for recognition, perspective taking, and cultural learning. Representation, however, involves more than placing diverse characters in a

classroom library. Teachers must consider how cultures are portrayed, whose perspectives are centered, and whether a text invites meaningful engagement with identity and lived experience.

Selecting a diverse book alone does not ensure meaningful literacy instruction. Teachers must know the text well enough to recognize its instructional possibilities and consider how students may experience the story. These decisions require familiarity with diverse literature and opportunities to practice selecting and teaching such texts during teacher preparation.

BookTok as a Digital Literacy Community

BookTok has become an influential digital community in which readers recommend books, interpret themes, share personal responses, and participate in literary conversations through short form video (Jerasa et al., 2024). Books and reader responses can circulate among individuals who do not share a classroom, library, or geographic community.

The educational significance of BookTok extends beyond reading promotion. Creating BookTok content requires attention to audience, communication, pacing, accessibility, visual presentation, and representation. When connected to an instructional purpose, these decisions may provide preservice teachers with an authentic setting for literacy decision making (Mishra & Koehler, 2006; Serafini, 2013).

BookTok may also introduce readers to texts and authors they might not otherwise encounter. For preservice teachers, this raises possibilities related to text discovery and selection. Engagement with diverse literature in digital reading communities may broaden knowledge of available texts while encouraging future teachers to examine how books and cultural experiences are represented and shared.

Research examining BookTok in teacher education remains limited. Less is known about how structured participation in BookTok may support preservice teachers as they engage with multicultural children's literature, make instructional decisions, and begin developing professional identities as literacy educators (Jerasa et al., 2024). This study examines BookTok as one possible site of teacher learning within a literacy methods course.

Conceptual Framework

This study draws upon New Literacies Theory, participatory culture, diverse text scholarship, and global literacies. Together, these perspectives provide a framework for examining how digital communication, literature, culture, and instructional decision making intersect within preservice teacher education.

New Literacies Theory recognizes that literacy practices change as technologies and the social practices surrounding them evolve (Leu et al., 2019). Literacy within digital environments requires more than technical competence. It involves purposeful communication, critical judgment, and an understanding of how digital spaces influence participation and meaning.

Participatory culture recognizes learning within communities where individuals create, share, respond to, and contribute knowledge (Jenkins, 2009). BookTok reflects these characteristics as readers publicly recommend, interpret, and discuss texts. Participation requires attention to audience, communication, and the responsibility associated with sharing content within a larger digital community.

Diverse text scholarship provides a lens for examining participants' engagement with multicultural children's literature. Bishop (1990) explains that literature may allow readers to recognize their own experiences while also encountering lives and perspectives beyond their own. Scholarship on culturally relevant and culturally sustaining pedagogy further emphasizes how students' experiences, language, and cultural knowledge shape learning (Gay, 2018; Ladson Billings, 1995; Paris, 2012). In this study, these perspectives informed the examination of how preservice teachers selected multicultural children's literature, interpreted identity and representation within the texts, and considered the instructional possibilities of those books for future literacy classrooms.

Global literacies connect these perspectives by recognizing that readers increasingly encounter texts and ideas across cultural and geographic boundaries (UNESCO, 2015). BookTok provides a relevant context because literature and reader responses can circulate beyond local literacy communities. Together, these perspectives guided the analysis of how preservice teachers engaged with diverse texts, made digital and instructional decisions, and reflected on their developing identities as literacy educators.

Methodology

This exploratory mixed methods study examined preservice teachers' experiences with a course embedded BookTok assignment in an undergraduate literacy methods course at a public university in the southern United States. The course prepares future elementary and middle grades teachers to design literacy instruction through children's literature, comprehension strategy instruction, engagement with diverse texts, and purposeful uses of digital technology.

Thirteen preservice teachers completed the BookTok assignment as part of their coursework. Five voluntarily consented to participate in the research study, resulting in a final sample of five participants, N = 5. Institutional Review Board approval was obtained before data collection, and only data from consenting participants were analyzed.

Students selected a multicultural children's text, developed an instructional read aloud, and created a short form BookTok style video designed to engage young readers while demonstrating literacy instruction. The assignment required students to consider text selection, cultural representation, audience, accessibility, and comprehension support while making decisions about how to communicate the text through digital media.

Data included a researcher developed questionnaire containing Likert scale and open-ended items and participants' completed BookTok videos. Survey items addressed digital confidence, audience awareness, engagement with multicultural literature, instructional decision making, and anticipated classroom application. Open ended responses asked participants to explain their text selections, instructional choices, digital design decisions, challenges, and perceptions of how the experience might influence future teaching. Videos were reviewed alongside participants' reflections for evidence of instructional choices such as captions, visual supports, narration, pacing, vocabulary instruction, questioning, and prediction.

Likert scale responses were analyzed descriptively using frequencies and percentages. Open ended responses and digital artifacts were analyzed thematically using procedures informed by Braun and Clarke (2006). Initial codes included audience awareness, accessibility, comprehension strategies, cultural representation, empathy, belonging, reflection, instructional

planning, digital confidence, and future classroom application. Codes were compared across participants and organized into broader categories.

Five themes emerged: purposeful digital composition for literacy instruction, digital literacies developed through pedagogical practice, multicultural literature as a foundation for inclusive literacy instruction, deeper literary understanding through reflective digital composition, and professional identity development through authentic digital practice. A cross-participant coding matrix was used to document thematic evidence. One participant completed the Likert scale items but did not provide open ended responses; therefore, missing narrative data were treated as insufficient qualitative evidence rather than evidence that a theme was absent. Survey patterns, participant reflections, and digital artifacts were considered together during interpretation.

Findings

Analysis of the survey responses, open ended reflections, and participant generated BookTok videos revealed five related themes: purposeful digital composition for literacy instruction, development of digital literacies through pedagogical practice, multicultural literature as a foundation for inclusive literacy instruction, deeper literary understanding through reflective digital composition, and professional identity development through authentic digital practice. Although the themes are presented separately, participants often discussed them in connection with one another. Decisions about digital features were frequently tied to comprehension, accessibility, cultural representation, and anticipated classroom use. P2 completed the Likert scale portion of the questionnaire but did not provide open ended responses; therefore, the thematic findings primarily reflect the qualitative data of P1, P3, P4, and P5.

Purposeful Digital Composition for Literacy Instruction

Participants consistently connected their digital design choices to literacy instruction rather than entertainment. Captions, music, visual supports, pacing, and text were selected to support vocabulary, comprehension, and engagement. These choices reflect digital composition as the intentional coordination of linguistic, visual, and auditory resources to communicate meaning (Cope & Kalantzis, 2015; Serafini, 2013).

While reading *My First Maya Angelou*, P1 used text visuals to introduce vocabulary and soft background music to establish an inspiring tone. Questioning also encouraged students to consider how they might respond to events in the text.

Similar instructional choices appeared in P4's BookTok for *All Are Welcome*. Captions supported spoken words, vocabulary appeared in large text, and photo transitions kept illustrations visible. These choices were intended to help students recognize difficult words and understand the text.

Comprehension strategies were especially visible in P5's reading of *Last Stop on Market Street*. Prediction, questioning, and context clues were modeled throughout the video. Captions highlighted vocabulary and thinking moments, while intentional pauses created opportunities for response. P5 described these strategies as “more visible and accessible” while keeping students involved.

Across participants, digital features were connected to vocabulary, comprehension, accessibility, and audience engagement. The BookTok format required participants to consider not simply which features were available, but why they belonged within a literacy lesson. This pattern aligns with Mishra and Koehler's (2006) view that effective technology integration depends on the relationship among technological, pedagogical, and content knowledge.

Developing Digital Literacies Through Pedagogical Practice

Participants also described BookTok as a space for practicing digital communication within an instructional context. Creating short form video requires decisions about audience, clarity, pacing, and instructional goals. Such decisions reflect digital literacies as socially situated practices involving the production, communication, and interpretation of meaning (Lankshear & Knobel, 2011; Leu et al., 2019).

For example, a digital flipbook allowed P3 to display the illustrations and words in *The Name Jar* while pairing the visual presentation with prediction questions and discussion of Unhei's feelings. P3 later described short form video as a way to make reading more interactive through performing, summarizing, and visualizing.

A more cautious perspective emerged in P5's reflection. Although short form video could support summarizing, theme identification, and communication of understanding, video production could also distract from literacy goals when expectations were unclear. Time, technology access, and editing demands were additional concerns. Future classroom use, P5 emphasized, would require structure and equitable access.

These responses moved beyond viewing digital literacy as technology use alone. Participants considered how digital choices influence communication, access, and learning while recognizing the instructional judgment required for meaningful classroom use (Mishra & Koehler, 2006).

Multicultural Literature as a Foundation for Inclusive Literacy Instruction

The multicultural texts prompted participants to consider representation, cultural identity, belonging, and perspectives beyond their own. These ideas reflect literacy scholarship emphasizing how students' experiences and cultural knowledge shape engagement with texts (Gay, 2018; Ladson Billings, 1995).

Cultural identity became especially significant in P3's reading of *The Name Jar*. The participant focused on Unhei's experience as a Korean child worried that her name made her different from her American classmates and connected the story to children who may have felt different or wanted to fit in. After realizing Unhei's name had initially been pronounced incorrectly, P3 reconsidered the character's feelings and cultural experience more carefully.

Questions of belonging shaped P4's reading of *All Are Welcome*. Attention centered on the repeated message of welcome and the cultures represented in the illustrations. As P4 explained, “I feel like students learn better by seeing themselves in the text.”

Socioeconomic difference, community, empathy, and perspective emerged in P5's reading of *Last Stop on Market Street*. The participant described multicultural literature as essential to classrooms where students see themselves reflected in what they read and warned that centering

only one type of story or perspective may leave some students feeling "invisible or disconnected from the material."

Together, these responses moved beyond general statements about diversity. Participants considered how texts may affirm students' identities while introducing readers to cultural experiences and perspectives beyond their own. This finding echoes Bishop's (1990) concept of books as mirrors, windows, and sliding glass doors.

Reflective Digital Composition Deepened Literary Understanding

Digital composition also prompted participants to revisit and reinterpret their selected books. Preparing a video required rereading, identifying ideas for emphasis, and considering how a young audience might understand the story. This process reflects reader response perspectives in which meaning develops through interaction between reader and text (Rosenblatt, 1978).

Repeatedly hearing the phrase "all are welcome" changed P4's understanding of the book. The repetition "truly clicked," leading the participant to interpret the text as a message not only for students but also for teachers and parents about creating welcoming environments.

An even more pronounced shift occurred as P5 revisited *Last Stop on Market Street*. Initially understood as a story about gratitude, the book took on greater complexity as P5 examined CJ's questions and comparisons with people who had nicer cars, headphones, and seemingly easier lives. P5 came to view the story as an exploration of how children notice inequality before fully understanding it and interpreted Nana as helping CJ reframe what he sees without dismissing his feelings. By the project's end, P5 described the book as "more emotionally layered" and as a conversation about empathy, perspective, and community.

These reflections show how BookTok construction became a form of close reading tied to instructional planning. In several cases, deciding what to emphasize changed how participants understood the text. The movement from reading to interpretation and digital composition reflects the recursive nature of meaning making described within multiliteracies scholarship (Cope & Kalantzis, 2015).

Authentic Digital Practice and Developing Teacher Identity

Participants frequently moved from discussing the assignment to imagining future classroom practice. P1 viewed digital tools as a way to involve students through audio, word visuals, music, and video. P3 anticipated using book talks on TikTok or YouTube to help students understand diverse texts and encounter different cultural perspectives, extending global storytelling into digital spaces where stories and ideas can reach audiences beyond the classroom.

Similar possibilities appeared in other participants' reflections. P4 expressed interest in using video to engage learners through visual and auditory support. P5 envisioned students creating short videos about character development, key events, and themes while explaining their thinking through inference, summarizing, and text connections. P5 also cautioned that comprehension should remain the focus and that teachers must plan for equitable participation.

Across the qualitative data, participants increasingly spoke as future teachers making decisions about learners, texts, access, and instructional purpose. The assignment provided space to

practice digital literacy and the professional judgment needed to determine when digital practices might serve students. Gee (2015) argues that identities develop through participation in social practices and communities. Participants' movement from completing a digital assignment to imagining similar practices for their own students reflects an emerging professional identity grounded in instructional decision making.

Discussion

The findings suggest that BookTok may offer teacher educators more than a familiar social media platform for increasing engagement. Within this study, the assignment created a space for preservice teachers to bring together digital literacy, instructional decision making, and sustained engagement with multicultural children's literature. Participants did not describe digital features as separate from teaching. Instead, captions, visual supports, pacing, music, and short form video were considered in relation to vocabulary, comprehension, accessibility, and audience. This finding supports the view that digital literacy involves purposeful communication and meaning making rather than technical competence alone (Leu et al., 2019; Mishra & Koehler, 2006).

The assignment also placed participants within a participatory literacy practice similar to the digital communities their future students increasingly encounter. Jenkins (2009) argues that participatory cultures position individuals as creators and contributors rather than passive consumers. Participants in this study moved from reading a children's book to interpreting it, making instructional choices, and creating literacy content for an audience. Their reflections suggest that this process required them to think about how a reader or viewer might encounter the text and what instructional supports might make meaning more accessible.

The findings also point to the importance of instructional structure. P5's concerns about technology access, editing time, and the possibility that video production could overshadow comprehension provide an important caution. BookTok itself does not produce meaningful literacy learning. The value of the assignment appeared to rest in the instructional expectations surrounding text selection, comprehension, cultural representation, audience, and reflection. This distinction is consistent with Mishra and Koehler's (2006) argument that technology becomes instructionally meaningful through its relationship with pedagogy and content.

Participants' engagement with multicultural children's literature also brought questions of representation, belonging, and perspective into their instructional thinking. Bishop's (1990) description of books as mirrors, windows, and sliding glass doors was reflected in participants' attention to children seeing themselves in literature while encountering experiences beyond their own. In this sense, global storytelling emerged through the movement of stories and cultural perspectives beyond a reader's immediate context, a connection central to global literacy education (UNESCO, 2015).

The composition process also prompted some participants to reinterpret the books themselves. P4's changing understanding of *All Are Welcome* and P5's deeper interpretation of inequality and perspective in *Last Stop on Market Street* suggest that digital composition may support reflective reading and pedagogical rehearsal. In some cases, preparing to communicate the text changed participants' understanding of it. A related pattern appeared in Jerasa et al. (2024), where repeated reading occurred as participants worked through BookTok construction decisions. The present findings extend that observation by showing how the composition process may also reshape preservice teachers' interpretations of literature.

Because this exploratory study included five consenting participants from one literacy methods course, the findings are not intended to be generalized to all preservice teachers. One participant did not provide open ended responses, limiting the qualitative evidence for that case. Future research should examine similar assignments with larger samples and consider how preservice teachers' familiarity with diverse texts and digital literacy practices develop over time. Despite these limitations, the study suggests that authentic digital literacy experiences may provide future teachers with opportunities to read diverse texts closely, consider representation, make instructional decisions, and imagine how contemporary literacy practices might be adapted for their classrooms.

Conclusion

The question raised at the beginning of this study was whether preservice teachers are being prepared for the texts, literacy communities, and forms of digital communication that increasingly connect readers across cultural and geographic boundaries. The findings suggest that preparation for contemporary literacy classrooms cannot stop with telling preservice teachers that diverse literature and digital literacy are important. Future teachers need opportunities to engage with diverse texts, examine representation, make instructional decisions, create for authentic audiences, and reflect on how those choices may shape students' literacy experiences.

In this study, BookTok provided one context for that work. Participants used digital features to support comprehension and accessibility, engaged with multicultural children's literature through questions of identity and perspective, and considered how similar practices might be adapted for future students. For some participants, the process of rereading and preparing a text for digital presentation also deepened their own literary interpretation.

BookTok should not be viewed as a replacement for established literacy instruction, nor should social media be incorporated into teacher preparation simply because it is popular. Its instructional value lies in the decisions surrounding its use. When grounded in purposeful text selection, literacy pedagogy, attention to learners and representation, and reflection, contemporary digital practices may create meaningful spaces for preservice teachers to rehearse the complex decisions they will eventually make in classrooms.

As literacy continues to move across digital, cultural, and geographic boundaries, teacher preparation must remain responsive to the ways readers encounter and share stories. Preparing future literacy educators means helping them know the texts, understand the learners, and make thoughtful choices about the spaces in which literacy learning occurs.

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

During the preparation of this manuscript, the author used AI-assisted technologies to assist with language refinement, readability, and organization. The author reviewed and edited the manuscript and takes full responsibility for its content.

References

Bishop, R. S. (1990). Mirrors, windows, and sliding glass doors. *Perspectives: Choosing and Using Books for the Classroom, 6*(3), ix–xi.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Cope, B., & Kalantzis, M. (Eds.). (2015). *A pedagogy of multiliteracies: Learning by design*. Palgrave Macmillan.

Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice* (3rd ed.). Teachers College Press.

Gee, J. P. (2015). *Social linguistics and literacies: Ideology in discourses* (5th ed.). Routledge.

Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century*. MIT Press.

Jerasa, S., Mitchell, M., Dokes, R., & Anagnostopoulos, J. (2024). TikTok to #BookTok: Preservice teachers navigating, situating, and transferring their digital literacy practices for teacher preparation. *Contemporary Issues in Technology and Teacher Education, 24*(4).

Ladson Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal, 32*(3), 465–491.

Lankshear, C., & Knobel, M. (2011). *New literacies: Everyday practices and social learning* (3rd ed.). Open University Press.

Leu, D. J., Kinzer, C. K., Coiro, J., Castek, J., & Henry, L. A. (2019). New literacies: A dual level theory of the changing nature of literacy, instruction, and assessment. In D. E. Alvermann, N. J. Unrau, M. Sailors, & R. B. Ruddell (Eds.), *Theoretical models and processes of literacy* (7th ed., pp. 319–346). Routledge.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

The New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review, 66*(1), 60–92.

Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology, and practice. *Educational Researcher, 41*(3), 93–97.

Rosenblatt, L. M. (1978). *The reader, the text, the poem: The transactional theory of the literary work*. Southern Illinois University Press.

Serafini, F. (2013). *Reading the visual: An introduction to teaching multimodal literacy*. Teachers College Press.

UNESCO. (2015). *Global citizenship education: Topics and learning objectives*.

Intercultural Learning and Self-Formation Through Japanese Tea Ceremony: Navigating Cultural Difference in an Overseas Community of Practice

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Abstract

Contemporary intercultural learning extends beyond acquiring cultural knowledge to participation in social practices where identities and meanings are continuously negotiated. This study examines intercultural learning through the teaching and learning of Japanese tea ceremony in the New York metropolitan area, focusing on how Japanese and non-Japanese practitioners engage with cultural difference within an overseas community of practice. Drawing on eight years of ethnographic research as both instructor and practitioner, the study analyzes participant observation, cultural events, and interviews. The findings reveal four key processes: (1) Japanese participants reconstructed their understandings of Japaneseness through intercultural encounters; (2) non-Japanese participants developed strong commitment to tea practice while integrating it into their own identities; (3) cultural differences persisted even among experienced practitioners rather than disappearing through participation; and (4) legitimacy within the community was continuously negotiated through practice and relationships rather than determined solely by cultural background. Based on these findings, the study proposes the Integrative Path of Intercultural Self-Formation**,** a framework that conceptualizes intercultural learning as an ongoing process of navigating cultural difference through participation in a community of practice. The framework extends Communities of Practice and intercultural learning theories by positioning cultural difference not as a barrier to overcome but as a constitutive condition through which communication, identity, and meaning are continuously formed.

Keywords: intercultural learning, intercultural education, Japanese tea ceremony, communities of practice, self-formation, cultural difference, ethnographic research

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Introduction

In contemporary intercultural education, learning is increasingly understood not simply as the acquisition of cultural knowledge but as an ongoing process of participation, interaction, and meaning-making within social contexts. Particularly in learning environments that involve cultural practices, learners do not merely acquire information about another culture; they engage with new ways of communicating, interpreting experiences, and understanding themselves in relation to others. Such learning processes become especially complex in overseas contexts, where cultural practices are introduced, interpreted, and transformed among participants from diverse cultural backgrounds.

This study examines intercultural learning through the teaching and learning of Japanese tea ceremony in the New York metropolitan area. Japanese tea ceremony provides a unique context for exploring intercultural learning because it is not only a traditional cultural practice but also an embodied and relational practice involving specific forms of communication, aesthetic appreciation, social interaction, and ethical values. Learning tea ceremony requires more than mastering procedures or acquiring cultural knowledge. Through sustained participation, learners gradually develop embodied skills, become familiar with community-specific meanings, and negotiate their relationships with both the practice and the community.

Although cultural practices such as Japanese tea ceremony are often introduced overseas as forms of cultural transmission, this perspective may overlook the dynamic processes through which participants interpret and reconstruct cultural meanings. In overseas contexts, cultural practices are not simply transferred from one society to another. Rather, they become intercultural spaces where participants with different backgrounds negotiate meanings, establish relationships, and construct identities through continued engagement.

Previous research on intercultural learning has provided important insights into how individuals develop awareness of cultural difference and intercultural competence. For example, Bennett's (2017) Developmental Model of Intercultural Sensitivity (DMIS) conceptualizes intercultural development as a progression from ethnocentric orientations toward ethnorelative perspectives. This framework has significantly contributed to understanding changes in how individuals perceive cultural difference.

However, developmental approaches that focus primarily on changes in intercultural sensitivity may not fully capture how intercultural learning unfolds through participation in shared practices. In many intercultural learning contexts, cultural differences do not simply disappear as individuals become more experienced. Instead, differences may remain visible and continue to shape communication, relationships, and identity development. Therefore, understanding intercultural learning requires attention not only to how individuals perceive cultural difference but also to how they participate in communities where such differences are continuously negotiated.

To address this issue, this study draws on the concept of Communities of Practice (Lave & Wenger, 1991), which conceptualizes learning as participation in a shared social practice. From this perspective, learning involves becoming a member of a community through increasing participation, rather than merely receiving knowledge from more experienced individuals. The framework is particularly useful for examining Japanese tea ceremony

because learners develop practical competence, social relationships, and a sense of belonging simultaneously through ongoing engagement.

Building on this perspective, the present study proposes the concept of **self-formation** as a way to understand the identity-related dimensions of intercultural learning. In this study, self-formation refers to the ongoing process through which learners reconstruct and integrate multiple cultural perspectives through participation in an intercultural community of practice. Unlike identity formation, which often emphasizes the development of a sense of belonging or social positioning, self-formation highlights the continuous transformation of the self through intercultural encounters.

Drawing on ethnographic research conducted over eight years as both a Japanese tea ceremony instructor and practitioner, this study investigates how Japanese and non-Japanese participants experience intercultural learning within an overseas tea ceremony community. The analysis focuses on three interconnected questions:

1. How do participants engage with Japanese tea ceremony as an intercultural learning practice?
2. How do participants negotiate cultural differences that emerge through continued participation?
3. How does participation in an overseas community of practice contribute to the formation of intercultural selves?

Based on the findings, this study proposes the Integrative Path of Intercultural Self-Formation, a framework that explains how learners move through processes of attraction to cultural difference, cultural affinity, cultural dissonance, recognition of enduring cultural gaps, and the integration of multiple cultural perspectives.

The term “path” is used intentionally because the framework does not describe a fixed or linear developmental sequence. Rather, intercultural self-formation is understood as an ongoing and sometimes recursive process in which learners move among different experiences as they encounter new practices, relationships, and cultural perspectives. The framework therefore differs from models that conceptualize intercultural development as movement toward a final stage of adaptation.

This study argues that intercultural learning is not primarily a process of adapting to or overcoming cultural difference. Instead, it is a process of navigating cultural difference through sustained participation in a community of practice, where communication, identity, and meaning are continuously negotiated.

Theoretical Background

Communities of Practice and Learning Through Participation

The primary theoretical framework informing this study is the concept of Communities of Practice (CoP) developed by Lave and Wenger (1991). CoP theory challenges traditional views of learning as the transmission of knowledge from expert to novice and instead conceptualizes learning as participation in a social world. Through legitimate peripheral participation, newcomers gradually become involved in community practices and develop both practical competence and a sense of membership.

This perspective is particularly relevant to the study of Japanese tea ceremony. Tea ceremony learning does not occur only through explicit instruction. While teachers may explain procedures, meanings, and historical backgrounds, learners also acquire knowledge through observation, imitation, embodied practice, and interaction with more experienced practitioners. They learn when to move, when to speak, when to remain silent, and how to interpret subtle aspects of tea practice that are difficult to fully articulate.

Therefore, becoming a tea practitioner involves more than acquiring technical skills. It involves developing a community-specific way of seeing, communicating, and participating. In this sense, learning tea ceremony is inseparable from becoming a member of the tea ceremony community.

However, overseas communities of practice involve an additional dimension that has received less attention: the continuous negotiation of cultural difference. While CoP theory emphasizes participation, identity, and meaning negotiation, intercultural communities require participants to engage with differences in assumptions, communication styles, and interpretations of practice. This study extends the CoP perspective by examining how cultural difference itself becomes part of the learning process.

Intercultural Learning and the Need for an Integrative Perspective

Bennett's (2017) Developmental Model of Intercultural Sensitivity provides an important framework for understanding how individuals develop increasingly complex understandings of cultural difference. The model describes movement from ethnocentric orientations, including denial, polarization, and minimization, toward ethnorelative orientations of acceptance and adaptation.

The DMIS has been highly influential in intercultural education because it highlights the developmental nature of intercultural awareness. However, the present study suggests that intercultural learning in practice-based communities may involve processes that cannot be fully explained through developmental movement toward adaptation.

The findings indicate that participants often became more aware of cultural differences as they became more deeply involved in tea ceremony. Increased participation did not necessarily reduce cultural gaps; instead, it sometimes revealed previously unnoticed differences in assumptions about hierarchy, communication, ritual, and social relationships.

Therefore, this study does not position cultural difference as something that learners eventually overcome. Rather, it examines how learners continue to participate while navigating differences that may remain unresolved. By bringing together Communities of Practice and intercultural learning perspectives, this study proposes an alternative understanding of intercultural learning as a process of self-formation through participation, negotiation, and ongoing engagement with cultural difference.

Research Method

This study adopts an ethnographic approach to explore intercultural learning within an overseas Japanese tea ceremony community. The research is based on approximately eight years of continuous participation in Japanese tea ceremony in the New York metropolitan area, during which I have been involved both as a tea ceremony instructor and as a

practitioner. This dual position enabled me to examine learning processes from within the community while also maintaining an analytical perspective on interactions, practices, and meaning-making.

The primary data were collected through participant observation of everyday teaching and learning activities, public workshops, cultural events, and other tea-related gatherings. Particular attention was given to interactions between teachers and learners, the ways knowledge was communicated and acquired, and moments in which cultural assumptions became visible through practice.

In addition to participant observation, formal and informal interviews were conducted with Japanese tea ceremony learners and instructors working in overseas contexts. Interviews explored participants' motivations for learning tea ceremony, their experiences of intercultural interaction, their understandings of Japanese cultural practices, and their reflections on participation in the tea ceremony community.

The analysis focused on how participants developed practical knowledge, negotiated cultural meanings, and constructed senses of self through sustained participation. Rather than treating learning as the acquisition of cultural information, this study examined learning as an ongoing process of participation in which communication, identity, and meaning were continuously negotiated.

Findings

The analysis revealed four major findings regarding intercultural learning within the overseas tea ceremony community. Together, these findings demonstrate that participation in Japanese tea ceremony involved not only learning a cultural practice but also engaging in ongoing processes of identity negotiation, meaning-making, and relationship building across cultural boundaries.

Rediscovering and Reconstructing Japaneseness Through Tea Ceremony

The first finding concerns how Japanese participants experienced tea ceremony as a process of rediscovering and reconstructing their own cultural identities. Several Japanese participants described that their engagement with tea ceremony developed after living outside Japan, where encounters with non-Japanese learners encouraged them to reflect on cultural practices they had previously taken for granted.

For these participants, tea ceremony became a space where they reconsidered aspects of Japanese culture such as hospitality, respect, aesthetics, and interpersonal relationships. Rather than simply recovering an existing cultural identity, they engaged in an active process of reconstructing their understanding of what it meant to be Japanese.

This process illustrates that intercultural learning does not occur only among those who are learning another culture. Individuals who are positioned as cultural insiders may also experience transformation through intercultural encounters. Interaction with learners from different backgrounds provided opportunities for Japanese participants to view their own cultural practices from new perspectives.

Thus, participation in the overseas tea ceremony community created a situation in which cultural identity became something to be continuously interpreted and reconstructed rather than something fixed or predetermined.

Cultural Affinity and Deep Commitment Among Non-Japanese Learners

The second finding concerns the strong commitment developed by many non-Japanese participants. For some learners, tea ceremony initially represented an opportunity to experience Japanese culture. However, through long-term participation, tea ceremony gradually became more than an object of cultural learning. It became an important practice through which they developed a sense of belonging and personal identity.

Several Japanese instructors informally described some long-term non-Japanese practitioners as being "more Japanese than Japanese" because of their exceptional dedication to tea practice. Although this expression was used informally and humorously, it reflected recognition of the learners' extensive commitment to studying tea ceremony, including procedures, etiquette, history, and underlying philosophies.

This finding challenges the assumption that cultural affiliation is determined primarily by nationality or cultural origin. Within the tea ceremony community, legitimacy was not based only on being Japanese or non-Japanese. Rather, commitment, participation, and accumulated practical knowledge became important sources of recognition.

At the same time, this process did not mean that non-Japanese learners simply became Japanese. Instead, they developed relationships with Japanese cultural practices while incorporating these experiences into their own existing cultural perspectives. Their learning involved the creation of new relationships between self and culture rather than simple cultural adoption.

The Persistence of Cultural Difference Through Deeper Participation

The third finding demonstrates that increased participation did not necessarily eliminate cultural differences. Instead, as learners developed deeper knowledge of tea ceremony, they often became more aware of cultural assumptions embedded within the practice.

For example, some experienced learners expressed difficulty with hierarchical communication patterns and traditional expectations regarding teacher-student relationships.

One participant explained:

> One very [important thing] I find [a] negative aspect of Japanese teaching method is when the teacher talks down to the students. That is, it's a very difficult way to get a message across, generally speaking. Hierarchy is OK. But it's how it's conveyed. (Ethan)

Another participant questioned whether certain traditional forms of interaction could be maintained within an American context:

> That's almost impossible to maintain in the United States. Because the whole concept of the first guest as being senior. It just doesn't make any sense. And the fact that only a first guest can speak. (Jeremy)

These comments came from experienced practitioners rather than newcomers. Their perspectives demonstrate that deeper cultural learning did not lead simply to acceptance or adaptation. Instead, greater familiarity with tea ceremony sometimes produced a more complex awareness of differences between cultural assumptions.

Importantly, these differences did not prevent continued participation. Participants continued to practice tea ceremony while maintaining critical reflections on certain aspects of the tradition. Cultural difference therefore functioned not only as a source of tension but also as an ongoing condition through which learning and meaning-making occurred.

Negotiating Authority, Legitimacy, and Membership

The fourth finding concerns the negotiation of authority and legitimacy within the overseas tea ceremony community. In intercultural learning environments, questions regarding who has the authority to teach, interpret, and represent a cultural practice become particularly significant.

Within the tea ceremony community, Japanese instructors occupied a complex position. As members of the cultural tradition, they were often expected to possess cultural authority and authenticity because of their Japanese background. At the same time, as instructors teaching overseas, they could also be positioned as outsiders to the host culture, facing linguistic and cultural challenges in their interactions with local learners. Their authority therefore could not be taken for granted but was continually negotiated in practice. Meanwhile, long-term non-Japanese practitioners also developed expertise and became respected members through sustained participation.

These findings suggest that legitimacy within the community emerged through a complex interplay of cultural background, practical competence, commitment, relationships, and participation. While Japanese identity often gave rise to expectations of cultural authority and authenticity, it did not in itself guarantee legitimacy. Rather, legitimacy was continuously negotiated as participants balanced cultural background with demonstrated competence and engagement in the shared practice.

Summary of Findings

Taken together, these findings reveal that intercultural learning in an overseas tea ceremony community involves complex processes that extend beyond cultural acquisition. Participants reconstructed their understandings of themselves, developed new relationships with cultural practices, encountered persistent differences, and negotiated membership within the community.

The findings suggest that cultural difference is not simply a barrier that learners overcome through increased knowledge. Rather, cultural difference remains present throughout the learning process and becomes part of how participants communicate, interpret practices, and form intercultural selves.

These observations provide the empirical foundation for the Integrative Path of Intercultural Self-Formation proposed in the following discussion.

Discussion: Toward an Integrative Path of Intercultural Self-Formation

The findings demonstrate that intercultural learning within an overseas Japanese tea ceremony community cannot be fully explained as a process of acquiring cultural knowledge or gradually adapting to another cultural system. While participants certainly developed increased understanding of Japanese tea ceremony through sustained participation, their learning experiences also involved uncertainty, negotiation, and continued engagement with cultural differences that were not necessarily resolved.

These findings suggest that intercultural learning is not simply a movement from unfamiliarity toward familiarity. Rather, it involves an ongoing process in which learners reconstruct their relationships with cultural practices, communities, and themselves. To conceptualize this process, this study proposes the Integrative Path of Intercultural Self-Formation.

Self-Formation as an Ongoing Process of Intercultural Learning

In this study, self-formation refers to the ongoing process through which learners reconstruct and integrate multiple cultural perspectives through participation in an intercultural community of practice.

The concept differs from identity formation in an important way. Identity formation often concerns how individuals develop a sense of belonging or position themselves within social categories. While identity remains an important aspect of participation, the present study focuses on a broader process through which learners continuously transform their ways of understanding themselves through intercultural encounters.

For participants in the overseas tea ceremony community, it was through the process of developing as a “tea practitioner” that they came to reshape their understandings of their relationships with Japanese culture, their own cultural backgrounds, and the cultural differences they encountered.

Therefore, self-formation emphasizes an ongoing and dynamic process. It does not represent the achievement of a final intercultural state but rather the continuous negotiation and integration of multiple cultural perspectives.

The Integrative Path of Intercultural Self-Formation

Based on the ethnographic findings, this study proposes six interconnected processes that characterize intercultural self-formation within an overseas community of practice:

1. Difference Attraction
2. Cultural Affinity
3. Cultural Dissonance
4. Realization of an Unbridgeable Cultural Gap
5. Navigation of an Unbridgeable Cultural Gap
6. Integration of Multiple Cultural Selves

These processes are presented analytically as a path; however, they should not be understood as a fixed or linear developmental sequence. Unlike developmental models that describe movement toward increasingly advanced intercultural orientations, the Integrative Path emphasizes an ongoing process in which participants may revisit earlier experiences as they encounter new practices, relationships, and cultural tensions.

The term "path" therefore does not suggest progression toward a final or complete intercultural identity. Instead, it refers to an ongoing process through which participants develop increasingly layered cultural selves, as the connections among different aspects of their experiences become more complex, intertwined, and deeply integrated over time.

From Difference Attraction to Cultural Affinity

The first two processes, Difference Attraction and Cultural Affinity, describe how learners initially develop relationships with tea ceremony as an unfamiliar cultural practice.

For many non-Japanese participants, cultural difference itself became a source of curiosity and motivation. The unfamiliarity of Japanese aesthetics, ritual forms, and embodied practices attracted learners and encouraged continued engagement.

Through sustained participation, this attraction developed into cultural affinity. Learners gradually developed emotional connections to tea ceremony and became increasingly involved in the community. Tea practice became incorporated into their everyday lives and personal identities.

At the same time, Japanese participants experienced a related but different process. Through interaction with non-Japanese learners, they rediscovered aspects of Japanese culture that had previously remained invisible to them. Their participation involved reconstructing rather than simply maintaining a pre-existing sense of Japaneseness.

These processes demonstrate that intercultural learning involves the transformation of relationships between self and culture. Cultural practices become meaningful through participation and interpretation rather than existing as fixed objects to be transmitted.

From Cultural Dissonance to the Recognition of Cultural Gaps

As participants became more deeply involved in tea ceremony, they encountered cultural dissonance. Increased knowledge did not necessarily eliminate uncertainty; instead, it often revealed deeper differences in assumptions about communication, hierarchy, authority, and social interaction.

This finding challenges the assumption that successful intercultural learning requires eventual resolution of cultural differences. In the tea ceremony community, experienced participants often developed a more sophisticated awareness of differences precisely because they had gained greater familiarity with the practice.

The fourth process, Realization of an Unbridgeable Cultural Gap, describes the moment when participants recognize that certain cultural assumptions cannot be completely reconciled with their own perspectives.

The concept of an "unbridgeable gap" does not imply failure, conflict, or rejection. Rather, it acknowledges that some differences remain meaningful even after extensive learning and participation. Recognizing such differences demonstrates deeper intercultural understanding because it acknowledges that some cultural differences remain meaningful even after extensive learning and participation.

Navigating an Unbridgeable Cultural Gap Through Community of Practice

The fifth process, Navigation of an Unbridgeable Cultural Gap, represents the central contribution of this study.

The findings demonstrate that participants continued to engage in tea ceremony despite recognizing cultural differences that remained unresolved. These differences were navigated through participation in the community rather than eliminated through adaptation.

This process can be understood through three interconnected dimensions of the Community of Practice framework.

First, shared practice provides a foundation for continued participation. Through repeated engagement with tea ceremony, participants develop common forms of communication, including specialized vocabulary, embodied knowledge, gestures, timing, and forms of interaction that are meaningful within the community.

Second, identity formation occurs as participants gradually develop a sense of membership. Importantly, membership is not determined only by cultural background. Instead, it emerges through sustained participation, practical competence, commitment, and relationships within the community.

Third, negotiation of meaning allows participants to interpret cultural practices collectively. For example, meanings associated with silence, hospitality, hierarchy, or ritual performance are not simply transferred from teacher to learner. They are continuously discussed, interpreted, and reconstructed through interaction.

By extending the Communities of Practice framework, this study argues that overseas communities of practice involve not only learning through participation but also the continuous navigation of cultural difference. Cultural difference is not external to the practice community; rather, it is one of the conditions through which communication, identity, and meaning are produced.

Integration of Multiple Cultural Selves

The final process, Integration of Multiple Cultural Selves, describes the ongoing development of a self that incorporates multiple cultural perspectives.

Integration does not mean that cultural differences disappear or that individuals fully merge different cultural systems into a single coherent perspective. Instead, it refers to the capacity to hold multiple ways of understanding and experiencing culture within oneself.

For participants in the tea ceremony community, integration involved maintaining engagement with Japanese tea practice while also retaining their own cultural perspectives.

They did not simply become Japanese or abandon their previous identities. Rather, they developed expanded understandings of themselves through continued participation across cultural boundaries.

This process represents the central meaning of intercultural self-formation: the development of a self that is capable of engaging with difference, negotiating ambiguity, and creating meaning through multiple cultural perspectives.

Implications for Intercultural Education

The findings offer several implications for intercultural education.

First, intercultural learning should not be understood only as the development of knowledge about other cultures or the achievement of adaptation. Learning in intercultural contexts involves ongoing participation in communities where meanings, relationships, and identities are continuously negotiated.

Second, educational environments should recognize cultural difference as a productive condition of learning rather than simply an obstacle to overcome. In language education, study abroad programs, multicultural classrooms, and community-based learning environments, encounters with difference provide opportunities for learners to reflect on their own assumptions and reconstruct their understandings of themselves and others.

Third, educators should acknowledge ambiguity and unresolved cultural differences as inherent aspects of intercultural learning. Rather than encouraging learners to eliminate uncertainty, educational approaches can support learners in developing the ability to navigate complexity through sustained engagement and dialogue.

From this perspective, intercultural education is not only about preparing individuals to function effectively across cultures. It is also about creating spaces where learners can transform themselves through meaningful participation with others.

Conclusion

This study examined intercultural learning through Japanese tea ceremony in an overseas community of practice. Drawing on eight years of ethnographic research, it demonstrated that learning involves more than acquiring cultural knowledge or technical skills. Through sustained participation, learners negotiate meanings, reconstruct identities, and form new relationships with cultural difference.

By proposing the Integrative Path of Intercultural Self-Formation, this study contributes a perspective that conceptualizes intercultural learning as an ongoing process of navigating cultural difference rather than overcoming it. The framework extends Communities of Practice theory by highlighting cultural difference as a constitutive condition of participation, identity formation, and meaning negotiation in overseas communities.

Although developed through the specific context of Japanese tea ceremony, this framework has broader implications for intercultural education and practice-based learning environments. It suggests that meaningful intercultural learning emerges not from the

disappearance of difference, but from continued engagement with difference as individuals and communities create new possibilities for understanding, participation, and self-formation.

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

I used ChatGPT to assist with the following tasks for this paper: proofreading and editing, searching for helpful resources, and having interactive discussions on particular points.

References

Bennett, M. J. (2017). Developmental model of intercultural sensitivity. In Y. Y. Kim (Ed.), *The international encyclopedia of intercultural communication*. Wiley. https://doi.org/10.1002/9781118783665.ieicc0187

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Practice of Tunnel Engineering Teaching With the Consideration of AI Application

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Abstract

The influence of the powerful generative artificial intelligence (AI) on education is reshaping the mode of education procedure. We should integrate AI in education to adapt to the potential of generative AI unsettling and upending in learning and teaching practice, as education today is crucially intertwined with technology, in terms of educational content and pedagogy. However, it is still on the way how to consider the functions of AI application in a professional course learning and teaching. We need specific experience from practice to make the AI application increasingly effective. Here is the practice of Tunnel Engineering teaching with the consideration of AI application, in terms of course content and presentation style design, the evaluations of both the reflection of the learning and teaching procedure and learning results. The results of the two-semester course teaching and near 120 students' learning evaluated with quiz, assignments open-book tests and course project in terms of Bloom's taxonomy, indicate (1) as we are taking the advantages of AI application in this professional course learning and teaching, the misleading or temporary prosperity induced by the abundant multi-functional information could blur student cognition developing; (2) students are skillful in AI application to sample information to finish objective issues, while most of the students are lost in subjective issues, where there need personal judgement and decision-making with various information; (3) it is vital to underline student personal thinking in learning procedure and timely evaluate the learning results under this plentiful and challenging education environment.

Keywords: practice, tunnel engineering teaching, AI application, learning evaluation

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Introduction

Artificial Intelligence (AI) is rapidly evolving (Samala et al., 2025) and increasingly reshaping education modes, as the education today is crucially intertwined with technology. Open GenAI tools such as ChatGPT and DeepSeek are directly or indirectly everyday companions in the tertiary learning and teaching activities. A global survey indicated that 86% of university students now use AI in their studies, with more than half engaging with these tools weekly (DEC, 2024). The influence of the GenAI on education is increasingly significant, such as in terms of learning and teaching.

It is vital to integrate AI in education to adapt to the potential of GenAI unsettling and upending in learning and teaching practice. As we use GenAI tools, it should be recognized that these tools are not specifically designed with educational goals since the large language models generate responses using probabilistic language modeling, rather than through conceptual understanding or reasoning (Vendrell & Johnston, 2026). The effectiveness of the AI tools heavily depends on how they are used (Samala et al., 2025). To be able to handle it appropriately, ethically, and efficiently, we need understanding the benefits and challenges of AI applications. For example, GenAI could support learning on the condition that being guided by clear teaching principles (OECD, 2026). However, if GenAI is used without pedagogical guidance, outsourcing tasks to GenAI simply enhances performance with no real learning gains, such as due to cognitive offloading and metacognitive disengagement (OECD, 2026). Similar findings of the impact of a range of digital tools on student learning outcomes shows that access to technology alone does not guarantee educational gain and successful digitalisation also requires pedagogical, not solely technical solutions (Forsström et al., 2025).

In general, the outputs of the GenAI tools are statistical recombination and imitation of the knowledge, experience, and works accumulated by humans over the past. As a learner, we need genuine personal experience to develop thinking capacity, as well as to cope with practical issues. As information is readily available, we need question what is correct and rectify information with critical and creative thinking before making decisions. It is suggested that institutions must ensure AI complements traditional learning, uphold academic integrity, and promote critical thinking (Nguyen, 2025). Emerging researches on the effects of the application of generative AI tools in education (e.g., Deng et al., 2025; Gerlich, 2025) indicated both beneficial and harmful outcomes, which are contingent rather than fixed (Vendrell & Johnston, 2026). We need the competency collaborating with AI systems in higher education on the condition without surrendering cognitive agency. However, in his transforming process, there is short of mature experience from practice to make the AI application increasingly effective, such as in terms of specific course learning and teaching. As a course is of service to students' capacity development, the effects of AI applications in the course learning should be timely assessed to follow student-centered education principle. Here is the preliminary practice of the Tunnel Engineering course learning and teaching with AI application under consideration.

Considerations in Practice

In the learning, process is more important than result as reflection should be embedded in the activity. Education is to cultivate student learning capacity, such as to study in vague, open, and long-term immersion fields, with complex systems thinking and deep philosophical understanding. In other words, learning is an experience involving process. The core of

experiential learning lies in the fact that learning is not a passive reception and reproduction of static knowledge, but rather an active experience of the knowledge meaning through a cycle of action, reflection, abstraction, and re-experimentation in real or simulated situations, and the construction of the meaning of learning and developing the ability to apply knowledge accumulated. The thinking capacity developing would focus on the abilities proposing original questions, making judgment in complex situations, extracting unique insights from experiences. The focus of a course is to contribute to these capacity developing, such as in terms course consideration, implementation plan and result evaluation.

Education is to serve society. Engineers would be involved in various cognitive processes, including problem-solving, decision-making, and reflective thinking in the future practice, which is of dynamic features. Therefore, the graduates would have the basic capacity of navigating and coping with the complex and dynamic environments. In terms of learning, the development of critical thinking is one of the basic capacity to make reasonable decisions (Halpern, 2012), is one of the key natures and fundamental cognitive skills for professional competence (Gerlich, 2025).

Impact From AI Application

The impact of AI technology on higher education is pervading in almost aspects. AI tools offer undeniable benefits in terms of efficiency and accessibility (Gerlich, 2025). During course learning and teaching, AI tools would provide environmental support for self-directed learning, resource platforms for personalized learning, and precise empowerment for learners with learning difficulties. Under AI's pervasive influence, the transition of both teaching and learning models is imperative. For example, the importance of traditional knowledge learning in higher education has significantly decreased and the cultivation of students' thinking abilities has become increasingly important. As information is readily available, one of the characteristics of the AI era is the increasing uncertainty. In this context, traditional thinking aimed at pursuing a single deterministic answer will no longer be applicable. In contrast, the cultivation of systems thinking, engineering thinking and creative thinking has become more important. Critical thinking is increasingly vital to cope with the dynamic situations, as considering the negative effects of AI application on critical thinking, such as cognitive offloading, diminishing users' engagement in deep, reflective thinking processes (Gerlich, 2025; Vendrell & Johnston, 2026). The effect of the AI application on learning outcomes, especially on critical thinking development should be evaluated in a course procedure.

Features of Capacity Requirements for the Course

In simplicity, Tunnel Engineering is a subject dealing with the planning, design, construction, operation and management of tunnels and underground structures. With the numbers and complexity of tunnels and underground structures increasing, the information pertaining to the Tunnel Engineering is accordingly accumulating. The features of the professional capacity requirements in the field of Tunnel Engineering would be under consideration in the course learning and teaching.

Features of the Course

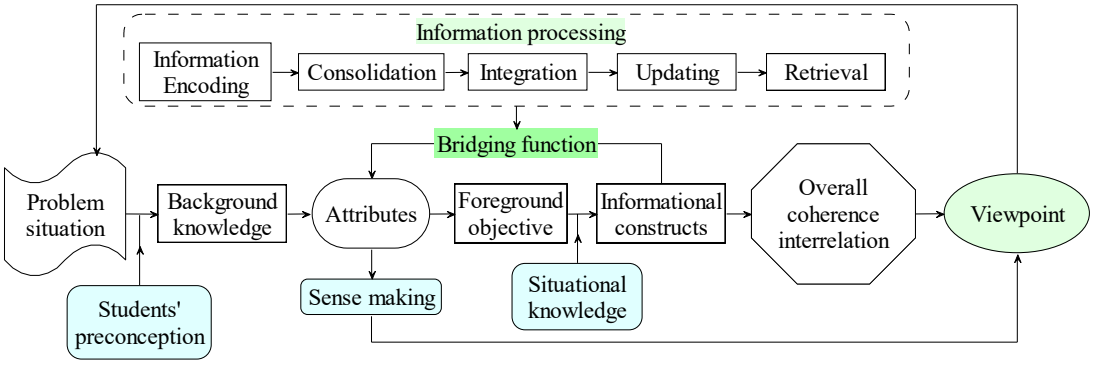
Of a professional course learning, we need understanding of what data, information, knowledge, and wisdom mean to us and how their interrelating enables us to define and move along a knowledge building pathways (Kaipa, 2000). Date and information could indicate us

hints to do things right, while knowledge means knowing making decision in a case. Students would transform from information accepting into an information assimilating in terms of knowledge building and capacity developing. It is a procedure of making the information separated to be assembled into a student's knowledge system, as shown in Figure 1. As the related information is too plentiful to be fully considered in the course learning and teaching practice, the course activity would focus on the basic information and knowledge, pertaining to the essential concepts, principles, theories, technologies in the field of tunnel and underground structures, such as with the application of systems thinking (Ma, 2022).

In general, there is professional tacit knowledge, which is characteristics of the unspoken expertise residing within personal mind. Tacit knowledge encompasses the practical skills, intuition, and personal experience that drive efficiency but are too complex to be written down. These subjective and personal insights would be learned through experience and operate under specific contextual intuition.

Figure 1

Information Processing, Sense Making and Knowledge Building Procedure



Note. Modified from Labour (2014).

Capacity Requirements

In terms of student capacity development, professional course learning would include learning ability and professional competence. Both of them depend on the level of critical thinking and sense making under complex situation. For example, a qualified engineer would have professional judgement to cope with complex project situation. During intrapersonal knowledge building or creation, there needs personal ability of verbal formulations to capture the essence of various aspects of unformulated experience, such as in terms of a step towards theorizing key aspects of an informational process, as sketched in Figure 1. This is a sense-making process under a specific situation and is strengthen by the bridging function of informational constructs and bringing together attributes that deduce from learner's sense-making process, with reflection and knowledge structuring being involved. Otherwise, the loosely accumulated knowledge will be meaningless or dissipated (Labour, 2014). Recently, the researches on memory storage and management mechanisms indicate that effective memory framework would consist of memory extraction, updating, retrieval, and utilization, enabling persistent experience regulation and long-range reasoning, and evolve from continuous learners long-range reasoning capacity (Liang et al., 2025). Otherwise, the process would be cognitive offloading and unfavorable to critical thinking skills developing (Gerlich, 2025) when individuals delegate cognitive tasks to external aids, reducing their engagement in deep, reflective thinking (Carr, 2010; Sparrow et al., 2011).

Evaluation Points and Parameters

Where a new education technology or education innovation in application, its impact on the learning and teaching would be timely evaluated with proper measures. However, there is often without a common language for impact or a consistent framework to measure and demonstrate it (DEC, 2026), such as in terms of shared understanding of what "impact" means or what success looks like, qualitative impact being largely uncaptured. As the learning process would be negatively influenced by improper AI tool usage such as due to increased cognitive offloading (Gerlich, 2025), the practice of a course plan implementation should be evaluated with proper measures (Vendrell & Johnston, 2026).

Evaluation Points

With learning procedure is under consideration, the learning evaluation would be executed in a dynamic mode. The main focus of the evaluation is to evaluate the influence of AI tool application on student's capability development in this study. To meet the various social requirements, the course evaluation points are of college characteristics, such as in terms of knowledge-level, personal abilities and objectives. Following the well-accepted parameters of personal capacity in social evaluation field, such as the Bloom's taxonomy (Anderson & Krathwohl, 2001), we consider creative thinking as top-level or higher-order. In terms of evaluating the influence of AI tools application on the cultivation of critical thinking, we consider mainly the cognitive ability development and metacognitive engagement in learning process, since improper use AI tools can attenuate critical thinking, such as due to cognitive offloading, metacognitive disengagement and epistemic narrowing (Vendrell & Johnston, 2026).

Parameters

The evaluation parameters would serve the key focus to investigate the influence of AI tool application on student critical thinking developing in the course learning process. Following the Bloom's taxonomy (Anderson & Krathwohl, 2001) and the parameters proposed by Vendrell and Johnston (2026) to evaluate the student intellectual processes in AI-applied learning environments, we consider the evaluation parameters, indications and practical cases (Table 1) in the course learning and teaching procedure. As noted by Vendrell and Johnston, (2026), these parameters are indeed interrelated processes, with the indication of learner's thinking and critical engagement, and could underpin higher-order thinking and critical engagement as learners navigate the epistemic affordances.

Table 1
Evaluation Parameters, Indications and Practical Cases in the Course Implementation

Parameters	Capacity indications	Practical cases in evaluation
Conceptual interpretation	Understanding, analyzing	Quiz, open-book test, closed-book and final exam
Inferential reasoning	Analyzing, evaluating, creating	Homework, course project, open-book test, closed-book and final exam
Evaluative judgement	Evaluating, decision-making	Homework, course project, open-book test, closed-book and final exam
Metacognitive regulation	Metacognitive monitoring and regulation	Homework, course project, open-book test, closed-book and final exam
Intellectual curiosity	Inquisitiveness, flexible thinking	Homework, course project, open-book test
Epistemic integrity	Truth-seeking, ethical reasoning	Homework, course project

Practice Evaluation and Results

Based on anonymous investigations on the situation of AI tools application in study, such as at course starting and during the course procedure, the two semesters results are similar. Nearly all of the students are using AI tools as a key referring measure in fulfilling academic assignments, such as homework, project and essay writing, though there is deference in tools option and the degree of dependence. They prefer AI tools in reference information sampling to the traditional browsing printed literatures. Therefore, we consider the course plan with AI application. During the course plan implementation, lecturing, extemporaneous discussions and minor quiz are still the main performance modes. The evaluation on the influence of the AI tools application on the students learning and capacity development mainly focus on the students' performance in the issues outside the classroom, including homework, course project, review report or essay writing on a specified topic. Open-book test and quiz within limited time are also used in the course process. The student learning efficiency and results would be generally checked with summative assessment measures.

Evaluation in the Course Practice

To cope with the dynamic and complex practical situations, professional course is to promote student thinking, being, and acting in the future. Therefore, professional education would improve student capacity for self-understanding, social critique, and principled action. These capacity would be generally evaluated with the parameters conceptual interpretation, inferential reasoning, evaluative judgement, metacognitive regulation, intellectual curiosity and epistemic integrity, as shown in Table 1. The evaluation points with the specified measures for the evaluation parameters are presented in the Table 2, to assess how critical thinking can be cultivated in AI-mediated learning environments, including dispositions at risk when AI tools are used uncritically (Vendrell & Johnston, 2026).

Table 2
Key Points of the Evaluation Measures for the Evaluation Parameters

Parameters	Key points of the evaluation measures
Conceptual interpretation	The ability to construct meaning by selecting, organising, and integrating information; to clarify concepts, discern relationships, and translate complex ideas into one's own understanding; to distinguish core ideas from peripheral details, reconcile competing views, and connect new input to prior knowledge
Inferential reasoning	The ability to generate reasoned conclusions from evidence; to identify assumptions, discern logical relationships, and predict implications; to construct arguments, identify causal links, test hypotheses across contexts, reason and make decision under uncertainty
Evaluative judgement	The ability to assess the credibility, coherence, and evidentiary basis of information and arguments; to compare competing interpretations and determine whether conclusions follow logically from premises; to judge the quality and relevance of information sources, especially under uncertainty
Metacognitive regulation	The ability to monitor, evaluate, and control one's cognitive processes during learning and reasoning; to assess task demands, recognise cognitive biases, and modify their approach with errors or gaps being detected
Intellectual curiosity	The motivation to explore ideas and questions, and pursue knowledge beyond requirements
Epistemic integrity	The traits of truth-seeking and fair-mindedness; the intellectual honesty with critical reflexivity

The evaluation is performed with formative and summative assessment measures, including course time presentation, quiz, homework, essay writing, course project, open-book test, midterm and final exams. Some of the assessment topics are specifically designed with AI application under considerations. Students are positively encouraged to indicate their AI tools usage levels and modes. In the formative assessments, the skills of the AI tools usage are also evaluation factor. The students submits are valued with the key points of the evaluation measures as reference indicators for the parameters, respectively.

Results

The results of the two-semester Tunnel Engineering course teaching and near 120 students' learning, evaluated with quiz, assignments open-book tests and course project in terms of the parameters (Table 1), the preliminary evaluation results on the effect of AI tools application in the learning are the followings.

Students are generally skillful to adapt to use an AI tool and to manage information available to fulfill a standardized task, such as answer a question without high logical or reasoning thinking being involved. More than half of the students can offer a polished essay writing on a specified topic, at least deferring to surface-level coherence. However, students' performance are not same as intuitive judgement when they are accomplishing a relatively complex task with the critical thinking parameters (Table 2) being involved. As the students learning performance being evaluated as well, fair and poor with the compliance to the evaluation measures, respectively, the statistical evaluation results are shown in Table 3. In

general, the well-performance ratio varies from 0.18 to 0.37, which is similar to the excellent ratio of student course achievements. In historical comparison, the student performances in AI-mediated environments are not superior to that of their antecedent peers, such as in terms of total score, results of summative test and course project, where critical thinking is underlined in assessments. The preliminary results imply that the AI-mediated environments, with plentiful information readily available, efficient and convenient tools, do not directly improve student capacity-building effectiveness, especially with critical thinking under consideration. Timely assessment of the learning and teaching procedure is indispensable in underpinning the importance of student's personal thinking under this plentiful and challenging education environment. It seems there need some additional measures being underlined to help students effectively taking advantage the AI era in a professional course learning.

Table 3
Evaluation Results of Learning Performance With Critical Thinking Under Consideration

Parameters	Well	Fair	Poor
Conceptual interpretation	0.37	0.51	0.12
Inferential reasoning	0.31	0.42	0.27
Evaluative judgement	0.25	0.39	0.36
Metacognitive regulation	0.22	0.36	0.42
Intellectual curiosity	0.18	0.31	0.51
Epistemic integrity	0.22	0.49	0.29

Discussion

In the era of AI widespread and deep penetration, the applications of GenAI tools would improve productivity in education and professional fields (e.g., DEC, 2026; Lee et al., 2025; Noy & Zhang, 2023). Based on the development trend of GenAI tools, it can be predicted that in the near future, all quantifiable, decomposable and repetitive works will ultimately be replaced by AI. For example, AI can quickly generate answers, charts, and solutions in response to a requirement. Under this situation, real knowledge will no longer be static information that requires mechanical memorization, but dynamic resources that need to be flexibly applied, critically questioned, creatively reconstructed and extended. Learning mode will inevitably undergo drastic changes to adapt to the new environment. It is necessary to clarify what skills can adapt to future needs, such as engineering and technical personnel doing. The existing consensus includes issues that cannot or are difficult to model. AI can improve efficiency, but tools cannot replace human's underlying abilities. For example, the ability to propose core questions based on reality and make value judgments on the results. Among them, critical thinking is indispensable. Learning is to cultivate what fuels you.

The results from the above-mentioned course practice imply that we need underline how to make the AI tools working effectively and thoughtfully in professional course procedure, such as in terms of student critical thinking developing. To be favorable to student critical thinking developing, the recent researches (e.g., Lee et al., 2025; Premkumar et al., 2025)

shot light on the aspects of disposition towards critical thinking, with critical openness and reflective skepticism, such as information verification, engineering thinking and being actively engaged with learning context. These issues give the key preconditions of AI application in an effective professional course learning.

Learning Thoughtfully With AI Application

Crucially, any benefit of offloading due to AI application will be contingent on the fact that the demand being offloaded is unnecessary with respect to the learning goal. Internal demand and metacognitive evaluations of demand play a crucial role in offloading, since cognitive offloading can have downstream effects on our low-level cognitive capacities and our subsequent metacognitions (Risko & Gilbert, 2016).

In a learning process with AI application, we need consider that the world facts are objective and rich, but the narrative is subjective. The information or knowledge presentations, such as in forms of word, figures and tables, are the extract fragments or partial information of the facts to state or display. What is actually stated is magnified, while the parts that are not stated are weakened or even ignored. Learning is a process of constantly accumulating knowledge and skills, which is arduous and challenging. The learning process without goals is difficult to sustain and reflect on, and the understanding of information available will not be profound. Learning thoughtfully needs reflection and metacognition being actively involved. For example, scientific argumentation tasks can be adopted as the instructional context to engage learners in explanation, monitoring, and revision, and to keep higher-order cognitive responsibility on the learner's side (Sun et al., 2026). Similarly, self-regulated learning, which includes the components—metacognition, cognition, and lifelong learning capabilities, would be favorable to cultivate innovation competencies encompassing curiosity, creativity, computational thinking and systems thinking (Maheshwari & Bhatt, 2025). This means an effective learning is thoughtful, object-oriented process, with critical thinking being one of the motivations.

The survey results of the impact of GenAI tools on knowledge workers critical thinking (Lee et al., 2025) indicate that higher confidence in AI is associated with less critical thinking, while higher self-confidence in one's own abilities is associated with more critical thinking and more effort in verification of the AI-generated content, and that several barriers, such as a lack of awareness of the need for critical evaluation, limited motivation due to time pressure, and difficulty in refining prompts—especially in unfamiliar domains, would inhibit critical thinking in AI using. This implies that there are preconditions for affective AI application in learning process, such as information verification, engineering thinking and being actively engaged with learning context.

Learning With Engineering Thinking

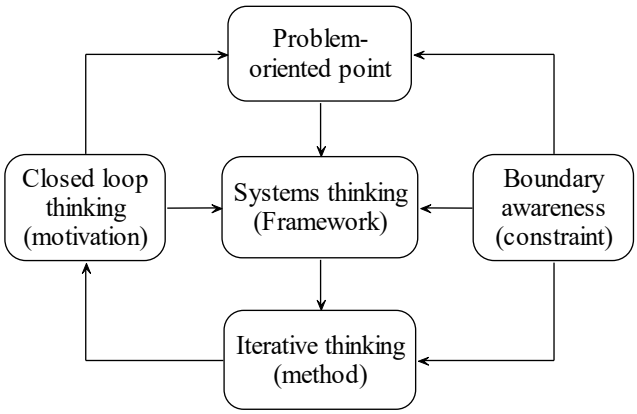
As information and knowledge are readily available in AI era, the capacity of understanding and transferring the information into personal knowledge system, as well as evaluating problem and creating solution to a practical requirement, is increasingly vital to a student professional competence. An efficient learning approach includes making the knowledge points under consideration into one's thinking chains or system. In other words, learning is not a passive reception and reproduction of static knowledge, but rather an active experience of the wisdom of knowledge through a cycle of action, reflection, abstraction, and re-experimentation in real or simulated situations, and the construction of the meaning of

learning and the ability to apply knowledge to practical issues. For example, when we are learning at something, we need to know not only the basic concepts, principles, theory, etc., but also what are the relationships between them, such as in terms of practical project. The key focus is to develop the ability to deeply abstract and reason about complex physical phenomena and causal relationships. These capacity seems the precondition to know which direction to look in practical project.

Engineering issues are of professional characteristics. Each discipline has its own unique way of thinking—a method of interacting with the world, such as professional custom and decision-making habits, which would be presented with tacit knowledge. In general, tacit knowledge refers to the subjective and personal insights one gains through experience and intuition, which are difficult to document, transfer, and articulate. However, in a professional field, knowledge is presented with concepts, theories and principles in a systemic style, which are presented in highly refined and abstract forms. We can consider the knowledge is the results of predecessors' comprehension condensed. Reading these information is not meaning understanding knowledge, since the refined knowledge could appears with direct indications of how predecessors comprehending, experiencing, anticipating, and simplifying the knowledge. True understanding needs a mental image, a sense, a predictive judgment of what this thing might be like, and only then does abstract presentation step in to transform the prediction into a rigorous expression. These preceding mental activities are usually presented as intuition, which is of professional characteristics and seems indispensable for a full knowledge understanding procedure. To grasp professional knowledge, intuition is sometimes necessary for something that cannot be fully attained by merely reading books. An effective learning process involves personally experiencing context exploration and reflection.

Engineering thinking focuses on how engineers thinking and making decisions, such as transiting vague ideas into physical issues in complex systems and uncertain conditions. This requires engineers start from practical problems to form a systematic solution and implement it into a project, with continuously iterating under real constraints. In other words, a well-developed practical engineering thinking is a closed loop thinking from practice to theory and back to practice. For example, engineering thinking would be considered being founded onto five components of problem-oriented points, systems thinking, iterative thinking, boundary awareness and closed loop thinking. Problem orientation is the direction, system thinking is the skeleton, iterative thinking is the method, boundary awareness is the guardrail, and closed-loop thinking is the engine. The combination of the five components is the complete engineering thinking, as shown the Figure 2. When a learner considers learning text under an engineering thinking context, there is good chance of reflection and information verification, as well as being engaged with the learning procedure. It seems one of the approaches of understanding professional knowledge, with personally experiencing context exploration and reflection effectively involved.

Figure 2
The Combination of the Five Engineering Thinking Components



Timely Evaluating the Learning Results

As the knowledge could be considered as distillation information presentation, which is characteristics of concise, abstract features. In terms of capacity developing, reading and learning knowledge available is not just about repeating a predefined procedure, such as knowing how to perform a calculation with a theory equation, but also about re-entering the path of understanding what happens in thinking developing. It is exactly what teaching and learning should do to cultivate personal thinking capacity. Otherwise, there is a good chance of thinking offloading in a learning procedure, mainly due to the readily available information, as well as the direct respond from AI tools for a question. Once attention becomes fragmented, thinking also becomes fragmented. As a person is immersing in easily available information, fragmented knowledge, it is difficult to develop engineering thinking habit and decision-making capacity without critical thinking being involved. This means learning procedure would be timely evaluated, such as in terms of the learning results, as well as the information verification capacity under this plentiful and challenging education environment.

When faced with complex and multifaceted information, we often rely on intuition to extract the key clue from the chaotic information. Intuition would be cultivated through practical examples, scenarios, analogies, experiments and repeated deliberation. For example, we understand a theoretical problem through experience, some guesswork, model or sketch, and then get a rough idea of the answer to the problem. To this point, knowing the answer does not mean that there appears exact numerical values, but first knowing the approximate shape, geometrical feature, limit behavior, and magnitude of the result. It is first making judgments, and then entering mathematical or abstract presentation. The preliminary judgment would be updated with the issues are proceeding. When this process is performed, learner is engaged with the context and meaningful issues.

Engineering practice is problem-oriented. The ability to solve problems is based on defining, breaking down, and analyzing issues, as well as understanding, interpreting, and applying existing information. Information does not automatically become cognition to finish these tasks, as judgments and decision-making are essentially the result of information interpretation, not the result of information itself. The same world, with different interpretations, yields different outcomes, because interpretive ability determines what a client focuses on and how to connect the related information. Of learning issues, the cultivation of cognitive skills is the core. It requires one's own framework for interpretation,

as shown in Figure 1. Therefore, the evaluation would be timely service for this capacity developing process in a course teaching practice.

Conclusion

Base on the preliminary practice of the Tunnel Engineering course learning and teaching with the AI application under consideration, the conclusions are as followings. (1) As we are taking the advantages of AI application in this professional course learning and teaching, the misleading or temporary prosperity induced by the abundant multi-functional information could blur student cognition developing. (2) Students are skillful in AI application to sample information to finish objective issues, while most of the students are lost in subjective issues, where there need personal judgement and decision-making with various information. (3) It is vital to underline student personal thinking in learning procedure and timely evaluate the learning results under this plentiful and challenging education environment. (4) It is beneficial to encourage students' being engaged with information verification to enhance student critical thinking developing.

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

The author declares that no AI or AI-assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Anderson, L. W., & Krathwohl, D. (2001). *A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives*. Longman.

Carr, N. (2010). *The shallows: what the internet is doing to our brains*. W.W. Norton & Company.

DEC (Digital Education Council). (2024). *Digital Education Council Global AI student survey 2024*. Digital Education Council.

DEC. (2026). *The Higher Education Innovation Impact Compass*. Digital Education Council.

Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2025). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. *Computers & Education*, *277*, 105224.

Forsström, S., et al. (2025). *The impact of digital technologies on students' learning: results from a literature review*. OECD Education Working Papers, No.335, OECD Publishing, Paris. https://doi.org/10.1787/9997e7b3-en

Gerlich, M. (2025). AI tools in society: impacts on cognitive offloading and the future of critical thinking. *Societies*, *15*(6). https://doi.org/10.3390/soc15010006

Halpern, D. F. (2012). *Halpern critical thinking assessment: Test manual*. Schuhfried GmbH.

Kaipa, P. (2000). Knowledge architecture for the twenty-first century. *Behaviour & Information Technology*, *19*(3), 153–161.

Labour, M. (2014). Understanding users' informational constructs via a triadic method approach: a case study. In F. Ibekwe-SanJuan & T.M. Dousa (Eds.), *Theories of Information, Communication and Knowledge, Studies in History and Philosophy of Science 34* (267–296). Springer.

Lee, H.-P., Sarkar, A., Tankelevitch, L., Drosos, I., Rintel, S., Banks, R., & Wilson, N. (2025). The impact of generative AI on critical thinking: self-reported reductions in cognitive effort and confidence effects from a survey of knowledge workers. In *CHI Conference on Human Factors in Computing Systems (CHI '25)*, 2025. https://doi.org/10.1145/3706598.3713778

Liang, J., Li, H., Li, C., Zhou, J., Jiang, S., Wang, Z., Ji, C., Zhu, Z., Liu, R. & Ren, T. (2025). AI meets brain: memory systems from cognitive neuroscience to autonomous agents. *eprint arXiv:2512.23343*. https://doi.org/10.48550/arXiv.2512.23343

Ma, J.-Q. (2022). The application of systems thinking in tunnel engineering course. *Learning and Teaching Methodologies, vol. 1*(1–23). Infonomics Society.

Maheshwari, M., & Bhatt, P. (2025). From learning to leading: how self-regulated learning drives innovation among a fresh management graduate. *Discover Education, 4*, 340. https://doi.org/10.1007/s44217-025-00802-1

Nguyen, K.V. (2025). The use of generative AI tools in higher education: ethical and pedagogical principles. *Journal of Academic Ethics*, *23*, 1435–1455. https://doi.org/10.1007/s10805-025-09607-1

Noy, S., & Zhang, W. (2023). Experimental evidence on the productivity effects of generative artificial intelligence. *Science*, *381*(6654), 187–192.

OECD. (2026). *OECD Digital Education Outlook 2026: Exploring effective uses of generative AI in education*. OECD Publishing, Paris. https://doi.org/10.1787/062a7394-en

Premkumar, P. P., Yatigammana, M. R. K. N., & Kannangara, S. (2024). Impact of generative AI on critical thinking skills in undergraduates: a systematic review. *Journal of Desk Research Review and Analysis*, *2*(1), 199–215.

Risko, E. F., & Gilbert, S. J. (2016). Cognitive offloading. *Trends in Cognitive Sciences*, *20*(9), 676–688.

Samala, A. D., Rawas, S., Wang, T., Reed, J. M., Kim, J., Howard, N. J., & Ertz, M. (2025). Unveiling the landscape of generative artificial intelligence in education: a comprehensive taxonomy of applications, challenges, and future prospects. *Education and Information Technologies, 30*, 3239–3278. https://doi.org/10.1007/s10639-024-12936-0

Sparrow, B., Liu, J., & Wegner, D.M. (2011). Google effects on memory: cognitive consequences of having information at our fingertips. *Science*, *333*, 776–778.

Sun, Y., Wen, S., Su, J., & Peng, D. (2026). Yìng duì rèn zhī wài bāo fēng xiǎn： jī yú kē xué lùn zhèng rèn wù de yǐ jiào wéi xué rén jī xié tóng mó shì [Addressing the Risk of Cognitive Outsourcing: A Learning-by-Teaching Human-AI Collaboration Model Based on Scientific Argumentation Tasks]. *Modern Distance Education Research*, *38*(3), 103–112.

Vendrell, M., & Johnston, S. (2026). Scaffolding critical thinking with generative AI: Design principles for integrating large language models in higher education. *Computers and Education: Artificial Intelligence*, *10*, 100572.

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Linking Mathematical Reasoning to Physics Understanding

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Abstract

Physics instruction traditionally presents projectile motion as a parabolic trajectory described by a quadratic equation. Although mathematically correct, this approach often emphasizes the completed path rather than the simultaneous evolution of two independent functions of time. We argue that students develop deeper conceptual understanding when they construct parametric models of motion from empirical observations instead of beginning with symbolic equations. Although parametric equations provide a natural framework for representing two-dimensional motion, they remain underused in physics instruction. Unlike previous studies that used interactive simulations primarily for visualization, this study employed the PhET Projectile Motion simulation as a source of empirical data from which students developed parametric models. The research investigated the effectiveness of an inquiry-based instructional intervention designed to promote conceptual understanding of projectile motion through mathematical modeling. Participants were 24 advanced high school students enrolled in an AP Physics 1 course. The intervention consisted of three 45-minute instructional units that guided students from constructing independent horizontal and vertical functions, x(t) and y(t), to developing a complete parametric model of projectile motion. Guided inquiry activities integrated simulation-based investigations with mathematical modeling tasks focused on interpreting position, velocity, and acceleration as vector-valued functions. Student learning was evaluated using a mixed-methods design that combined survey responses with descriptive analyses of conceptual kinematics tasks. Results indicate that the intervention improved students' ability to interpret projectile motion as the simultaneous evolution of two independent functions linked by the common parameter of time. These findings suggest that simulation-supported parametric modeling provides an effective framework for strengthening conceptual understanding and connecting mathematics with physics.

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Introduction

Projectile motion is one of the most conceptually challenging topics in upper secondary and introductory undergraduate physics courses because it requires students to integrate concepts from kinematics, vectors, algebra, functions, and graphical representations into a coherent two-dimensional model of motion. Students are expected to understand that the horizontal and vertical components of projectile motion are independent yet together determine the characteristic parabolic trajectory. Despite this conceptual framework, instruction frequently reduces projectile motion to a collection of kinematic equations that students apply algorithmically. Consequently, many students can solve textbook problems procedurally but struggle to explain the underlying physical principles or interpret mathematical equations as meaningful representations of physical phenomena (Eichenlaub & Redish, 2019; Kuo et al., 2019). Traditional instruction often emphasizes algebraic manipulation and numerical problem solving while providing limited opportunities for students to construct conceptual links among position, velocity, acceleration, and time or to interpret mathematical functions as models of physical phenomena.

Recent research in physics and mathematics education advocates instructional approaches that emphasize mathematical reasoning rather than formula manipulation. Mathematical reasoning enables students to recognize structural relationships among physical quantities, formulate covariational relationships, and develop mathematical models that explain physical phenomena (Sokolowski, 2021). By integrating mathematical reasoning with scientific inquiry, students develop a deeper understanding of both the algebraic representations that underline physical laws and the physical meaning of these representations. This perspective aligns with research on multiple representations, which suggests that conceptual understanding is strengthened when learners coordinate symbolic, graphical, numerical, and contextual representations of the same phenomenon (Lesh & Doerr, 2003). Within this framework, mathematical functions become more than computational tools; they serve as models that describe continuous relationships among changing quantities and provide a foundation for explaining physical behavior.

Parametric functions provide a natural mathematical framework for modeling projectile motion by expressing the horizontal and vertical coordinates as separate functions of time. Unlike the Cartesian equation y(x) of a parabola, parametric functions explicitly describe an object's movement, allowing students to examine the horizontal and vertical components simultaneously while preserving their independence. This representation supports students in connecting symbolic equations with graphical and physical representations of motion while interpreting how each coordinate changes continuously over time. Research in mathematics education has consistently demonstrated that conceptual understanding is strengthened when students coordinate multiple representations, including symbolic, graphical, numerical, and contextual formsand use these representations to construct and interpret mathematical meaning (Ainsworth, 2006; Jäder & Johansson, 2025; Munfaridah et al., 2021). Although parametric functions constitute a natural mathematical language for representing multidimensional physical phenomena, they remain underutilized in physics education, where instruction continues to rely predominantly on Cartesian representations and formula-based problem solving (Sokolowski, 2023). This underrepresentation is noteworthy because parametric function modeling promotes covariational reasoning and empirical–mathematical modeling, enabling students to interpret motion as the simultaneous variation of multiple quantities (Sokolowski, 2021, 2023). From this perspective, parametric functions serve not merely as

computational tools but as mathematical models that describe the coordinated variation of horizontal and vertical position with time.

Interactive computer simulations can further enhance students' understanding by enabling them to manipulate variables, observe immediate feedback, and effectively compare mathematical representations with physical phenomena. The PhET Interactive Simulations developed at the University of Colorado Boulder provide an inquiry-based learning environment in which students can generate data describing horizontal and vertical position as functions of time, examine the corresponding velocity and acceleration functions, and explore how changes in initial conditions affect the resulting trajectory. Such interactive environments promote active learning, scientific inquiry, and conceptual understanding when combined with guided instructional activities (Wieman et al., 2008).

The instructional approach presented in this paper is grounded in constructivist learning theory, which views knowledge as actively constructed through exploration, reflection, and interaction with meaningful tasks (Piaget, 1970; Vygotsky, 1978). It also builds on the empirical–mathematical modeling framework proposed by Sokolowski (2021), in which students formulate mathematical models directly from empirical observations, analyze relationships among variables, and validate those models against physical behavior. In this study, students use the PhET Projectile Motion simulation to collect and analyze empirical data, construct parametric functions that model the horizontal and vertical components of projectile motion, interpret the physical meaning of these functions and their parameters, validate the resulting models against simulated motion, and coordinate graphical, numerical, symbolic, and physical representations of projectile motion.

Literature Review

Physics education research has documented persistent misconceptions about projectile motion and proposed a variety of instructional approaches to address them. Early studies focused on helping students develop a more coherent understanding of the vector nature of the parameters describing the motion. For example, Mihas and Gemousakakis (2007) emphasized that an object's velocity vector is always tangent to its trajectory and that, under constant speed, centripetal acceleration is perpendicular to the tangential velocity. Similarly, Springuel et al. (2007) used cluster analysis to examine how students conceptualize vectors representing acceleration, revealing persistent difficulties in interpreting vector quantities during two-dimensional motion. While these ideas target the vectorial nature of kinematic quantities embedded in the analysis, they assume a deep understanding of vector components, which may pose an additional pedagogical obstacle.

Other researchers have introduced alternative instructional contexts to strengthen students' conceptual understanding of projectile motion. Rather than analyzing projectile motion from a stationary frame of reference, Millar and Kragh (1994) and Klein et al. (2014) situated the launch platform on a moving vehicle. This approach was supposed to help students recognize that a released object retains the horizontal velocity of its carrier and illustrates the principle of relative motion. Although this context encourages inquiry and conceptual exploration, it simultaneously introduces the additional complexity of relative motion, potentially diverting attention from the fundamental goal of understanding the independence of horizontal and vertical motion. Consequently, successful implementation of this approach presupposes that students already possess a solid understanding of one- and two- dimensional kinematics.

Another line of research has demonstrated the benefits of technology-enhanced instruction. Wee et al. (2012) employed computer software to trace projectile trajectories, allowing students to visualize the resulting parabolic path. Jimoyiannis and Komis (2001) integrated computer simulations with vector analysis to improve students' conceptual understanding of motion in a gravitational field. Likewise, Klein et al. (2014) used tablet-based video analysis to generate position data, graph motion components, and derive mathematical functions describing projectile motion. Aslan (2021) reported that GeoGebra-assisted instruction reduced misconceptions among pre-service science teachers by enabling them to compare dynamic visualizations with their own predictions. Together, these studies demonstrate that interactive technologies facilitate conceptual learning by linking physical motion with graphical and mathematical representations.

Several studies have also examined conceptual understanding from broader perspectives. Das and Roy (2014) extended traditional projectile motion by incorporating air resistance proportional to the square of velocity, allowing students to investigate more realistic trajectories. Espinoza (2004) connected projectile motion to momentum, finding that students who studied momentum before forces demonstrated a stronger understanding of the tangential nature of velocity. Similarly, Gamble (1989) argued that reconstructing students' conceptual frameworks leads to more meaningful learning in mechanics than emphasizing procedural problem solving alone.

More recent research has focused on scientific reasoning and the coordination of multiple representations. Hidayatulloh et al. (2021) reported that students experience substantial difficulties interpreting graphs and vector representations of projectile motion, particularly those involving velocity and acceleration. The authors concluded that instruction should explicitly help students translate among symbolic, graphical, and vector representations. Jamaludin et al. (2025) found that inquiry-oriented experiments combined with peer discussion promoted deeper conceptual understanding by encouraging students to predict outcomes, interpret evidence, and revise their reasoning. Likewise, Shofiyah et al. (2024) demonstrated that students with stronger scientific reasoning exhibited a better understanding of projectile motion concepts, suggesting that instruction should emphasize hypothesis generation, evidence-based reasoning, and explanation rather than routine algebraic manipulation.

Collectively, these studies indicate that the most effective instructional approaches combine inquiry-based experimentation, interactive technologies, multiple representations, and scientific reasoning. Existing research on teaching projectile motion has largely emphasized conceptual change, multiple representations, computer simulations, and inquiry-based learning, whereas comparatively little attention has been devoted to using parametric equations as a central instructional representation. Most of the studies continue to rely on Cartesian equations, vector diagrams, or graphical analyses without explicitly engaging students in modeling two-dimensional motion through time-dependent functions as the initial quantitative tools for representing motion. Because parametric equations naturally represent multidimensional phenomena, they provide opportunities to strengthen students' covariational reasoning as well as the quality of vectorial analysis (Sokolowski, 2021, 2023, 2025). This study builds on earlier work that introduced the parametrization of projectile motion as an instructional framework for undergraduate physics students (Sokolowski, 2021). Whereas the earlier work focused primarily on the mathematical formulation of parametric models at the college level, the present study extends this approach to secondary physics education by integrating inquiry-based instruction, empirical data collection, and simulation-supported mathematical modeling. The present study addresses this shift by integrating parametric

equations with the PhET Projectile Motion simulation within a constructivist, inquiry-based instructional framework.

Theoretical Framework and Instructional Rationale

The present study is grounded in the premise that conceptual understanding in physics develops through the construction of mathematical models rather than through the application of memorized formulas. Within the empirical–mathematical modeling framework (Sokolowski, 2018, 2020, 2023), mathematical functions are viewed as representations of observed physical relationships rather than symbolic expressions to be manipulated independently of their physical meaning. Students therefore develop conceptual understanding by identifying relationships among physical quantities, expressing these relationships through mathematical functions, and interpreting the resulting models in terms of the behavior of physical phenomena.

A central feature of this framework in this study is parametric modeling, in which a physical phenomenon is represented by two or more functions connected through a common independent parameter of time. Rather than treating equations as isolated mathematical objects, parametric models describe how multiple physical quantities evolve simultaneously as functions of the same time variable. In kinematics, time serves as the common parameter linking the horizontal and vertical components of motion, allowing students to interpret two-dimensional motion as the coordinated evolution of independent yet complementary functional relationships. From this perspective, parametric equations are not merely an alternative mathematical notation but a modeling framework that reveals the structure of physical phenomena.

Projectile motion provides an ideal context for developing this type of reasoning because it requires students to coordinate the behavior of multiple representations to describe the phenomenon. Parametric modeling emphasizes that the horizontal and vertical coordinates are generated independently while remaining synchronized through the common parameter of time. Consequently, the familiar parabolic trajectory emerges as a consequence of these coordinated functional relationships rather than as the primary object of study. This shift encourages students to focus on the underlying physical processes instead of memorizing equations that describe the resulting path.

This perspective is consistent with constructivist theories of learning (Piaget, 1970; Vygotsky, 1978), which suggest that knowledge is actively constructed through meaningful experiences. Interactive simulations provide an environment in which these representations can be explored simultaneously while allowing students to generate, test, refine, and validate parametric models through empirical observations.

Unlike traditional instruction, which typically derives kinematic equations before asking students to apply them to projectile motion, the instructional sequence presented in this study deliberately postpones symbolic equations until students have accumulated sufficient empirical and graphical evidence to formulate their own mathematical models. The PhET Projectile Motion simulation serves not merely as a visualization tool but as a source of empirical data from which students construct parametric models describing two-dimensional motion. Consequently, equations become explanations of observed physical behavior rather than formulas to be memorized, reinforcing the view that mathematical models emerge from empirical evidence.

The central hypothesis underlying this instructional design is that students who construct parametric models from empirical observations develop a more coherent understanding of projectile motion than students who learn the topic primarily through symbolic manipulation. Specifically, the instructional sequence was designed to help students recognize projectile motion as the simultaneous evolution of two independent functions linked by the common parameter of time. By constructing, interpreting, and validating these parametric models, students develop stronger connections between mathematical reasoning and physical interpretation, leading to a deeper conceptual understanding of projectile motion and greater success in problem solving.

Methodology

Research Design

Following the experimental design taxonomy of Shadish et al. (2002), this study employed a single-group posttest design to investigate the effects of a constructivist instructional intervention on students' conceptual understanding of projectile motion. Because the purpose of the study was exploratory, a mixed-methods approach was adopted, combining descriptive quantitative data with qualitative analyses of students' written responses.

The instructional intervention was motivated by well-documented findings that many students can solve projectile-motion problems procedurally while remaining unable to explain the underlying physics. Students frequently struggle to answer questions such as:

- Why does the horizontal velocity remain constant?
- Why does the vertical velocity change?
- How can two independent functions describe a single motion?

These persistent conceptual difficulties motivated the following research question:

Research Question

How does constructing and interpreting parametric functions influence students' conceptual understanding of projectile motion?

To investigate this question, students completed a post-instruction survey and were asked to justify their responses verbally to assess their conceptual understanding of two-dimensional motion.

Which learning experience most helped you understand projectile motion as the combination of two algebraic functions?

(A) Observing real-world demonstrations
(B) Experiences outside the classroom
(C) The three-unit laboratory sequence

Participants

Participants were 24 students enrolled in an Advanced Placement (AP) Physics 1 course at a suburban high school. None had received formal instruction in physics prior to the study. The sample consisted of 18 seniors and 6 juniors. At the time of the intervention, 16 students were enrolled in Calculus, whereas 8 were enrolled in Precalculus.

Instructional Intervention

The instructional intervention was designed in response to previous research indicating that students have trouble interpreting algebraic equations in physical contexts, decomposing projectile motion into independent horizontal and vertical components, and coordinating multiple mathematical representations of motion.

Grounded in constructivist learning theory and empirical–mathematical modeling (Sokolowski, 2021), the intervention consisted of three 45-minute instructional units in which students progressively constructed parametric models of projectile motion from observations obtained with the PhET simulation. Working collaboratively, they formulated hypotheses, compared graphical, symbolic, and physical representations, tested their models against simulated motion, and refined their explanations. Learning therefore emphasized the construction of conceptual understanding rather than the application of memorized formulas.

Introducing parametric equations before formal instruction on projectile motion served two complementary purposes. First, it reduced cognitive load by separating the learning of a new mathematical representation from the simultaneous learning of a new physical phenomenon (Clark & Mayer, 2016). Second, it supported constructivist learning by allowing students to build progressively richer mental models of motion through increasingly complex applications of the same mathematical structure.

Throughout the activity, students coordinated graphical, symbolic, and physical representations while interpreting the mathematical properties of parametric functions in terms of the corresponding physical quantities. This integration of modeling and conceptual reasoning reflects the study's constructivist framework.

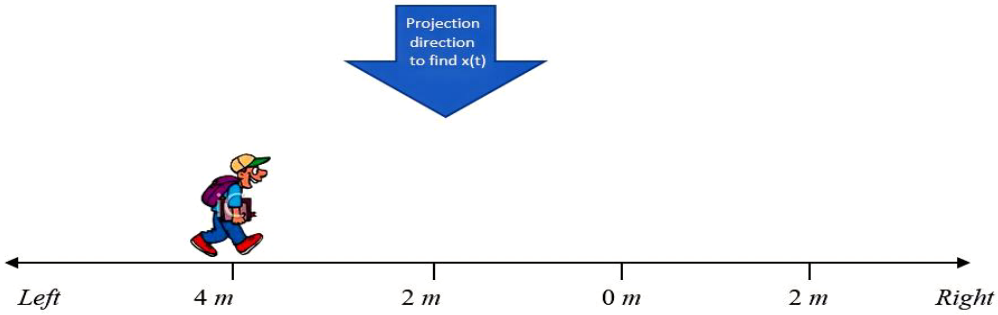
Unit 1. Developing Component Functions

The instructional goal of Unit 1 was to develop students' representational fluency by extending one-dimensional motion into two-dimensional component functions through inquiry-based analysis of uniform motion.

Part A. Uniform Motion

Students were presented with a diagram (see Figure 1) of a person walking. The person's horizontal position at selected times was provided.

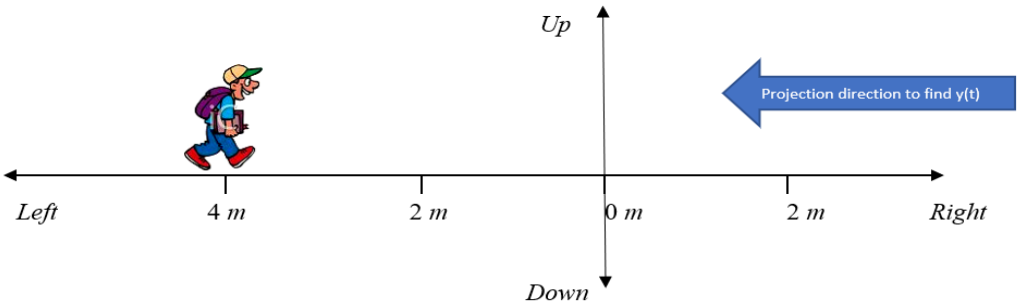
Figure 1
Reference Line to Formulate Top View of the Function



Using the top-view representation, students determined the horizontal position function, $x(t) = 2t - 4$.

To complete the motion description, students' attention was redirected to the side view (see Figure 2) to determine the vertical position function of the walking person.

Figure 2
Reference System to Formulate Side View for the Parametric Function



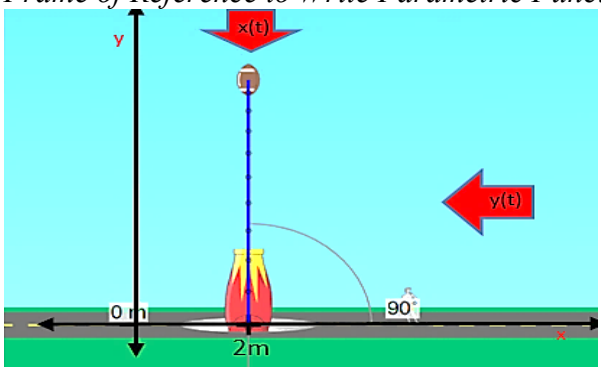
Because the side view did not indicate any movements of the person, students concluded that $y(t) = 0$. Thus the parametric functions that modelled the person's position were $x(t) = 2t - 4$ and $y(t) = 0$.

Although the motion was one-dimensional, students represented it using both horizontal and vertical component functions. This low-cognitive-load activity established the representational framework needed for later analyses of projectile motion.

Part B. Accelerated Motion

This activity introduced the key idea that different motion components may be described by different functions while sharing a common time parameter. The frame of reference was consistently provided (see Figure 3).

Figure 3
Frame of Reference to Write Parametric Functions for Free Fall



Students determined that the side view $y(t) = 30t - \frac{9.8t^2}{2}$ represented the vertical position function, while the top view represented the constant horizontal position, $x(t) = 2$.

This activity introduced the important conceptual idea that different components of the same motion may be described by different types of functions while sharing a common time parameter. Students therefore began coordinating multiple mathematical representations of a single physical event, an ability that is central to the study's theoretical framework.

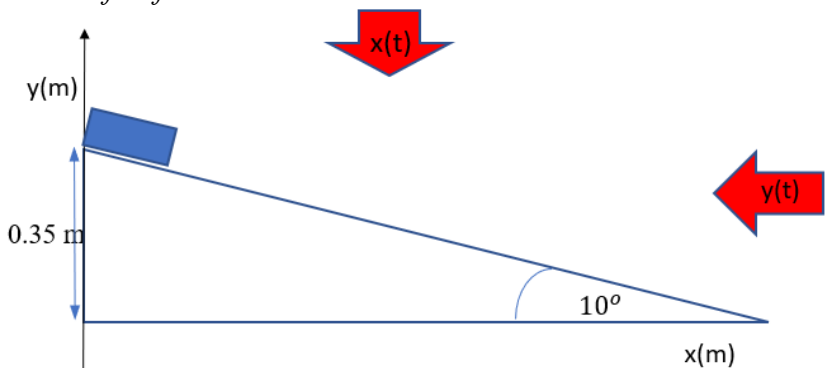
The primary conceptual insight from this activity was that each component of motion must be analyzed independently. Once students became comfortable constructing component functions in familiar situations, they extended this reasoning to motion on an inclined plane.

Unit 2. Motion on an Inclined Plane

The instructional goal of Unit 2 was to extend parametric modeling by using trigonometric ratios to determine vector components in a laboratory investigation of motion on an inclined plane (see Figure 4).

Traditionally, motion on an inclined plane is analyzed using coordinate axes parallel and perpendicular to the inclined plane. Students began with this conventional representation. Using a photogate, they measured the object's position at specified time intervals, constructed a data table and, from the quadratic form of the generated position-time graph, concluded that the object's acceleration was $a = 1.70\ \frac{m}{s^2}$.

Figure 4
Frame of Reference to Parametrize Motion on an Inclined Plane



The coordinate system was then redefined according to the side view (y-axis) and top view (x-axis). Students recognized that acceleration, velocity, and position each possess horizontal and vertical vector components. They found the components of the acceleration along the newly established views and concluded that $a_x = 1.7\cos(10^o) = 1.67\frac{m}{s^2}$, and $a_y = 1.7\sin(10^o) = 0.30\frac{m}{s^2}$. Finding the components of the acceleration initiated the modeling process for the parametric position functions.

$$y(t) = 0.35 - \frac{0.30t^2}{2} \text{ (side view)} \quad (1)$$

$$x(t) = \frac{1.67t^2}{2} \text{ (top view)} \quad (2)$$

In this activity, students derived the parametric equations directly from experimental evidence rather than receiving symbolic equations from the instructor. This represented the study's key conceptual transition.

Resolving motion into orthogonal components helped students coordinate vector, graphical, and algebraic representations. After transforming the coordinate system to the standard x- and y-axes, they formulated and sketched the corresponding position, velocity, and acceleration functions.

This activity completed the transition from one-dimensional reasoning to two-dimensional parametric modeling, preparing students to analyze projectile motion.

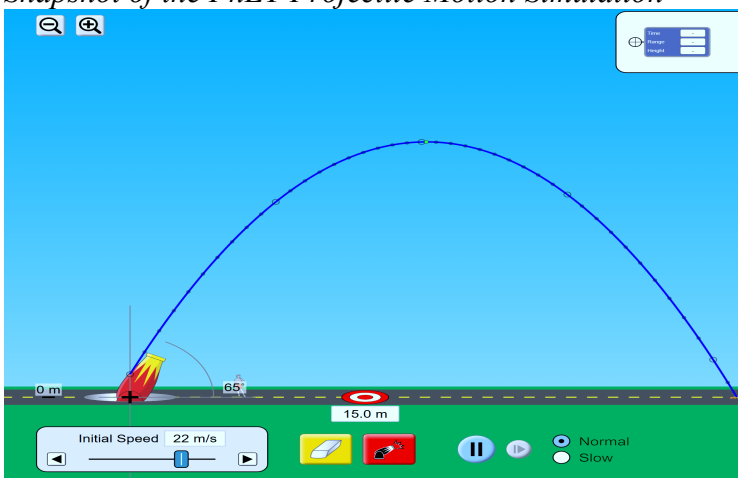
Unit 3. Resolving Parabolic Path Into Component Functions

Building on Units 1 and 2, this final instructional sequence extended component analysis to full projectile motion. Students integrated conceptual understanding, mathematical modeling, and scientific reasoning to derive and justify parametric models from empirical evidence.

Students investigated projectile motion using the PhET Projectile Motion simulation (PhET Interactive Simulations, n.d.) which served as a source of empirical data. By recording successive coordinates of the projectile, students generated horizontal and vertical position data and constructed the corresponding parametric functions x(t) and y(t).

The central objective was to help students recognize that projectile motion emerges from the simultaneous evolution of two independent functions linked by time rather than from a single quadratic equation. Students therefore constructed parametric models directly from empirical observations.

Figure 5
Snapshot of the PhET Projectile Motion Simulation



Students received instructional support containing a snapshot of the trajectory, along with guidance on collecting data and formulating the object's position functions.

Following the established top and side views, students completed a table containing time, horizontal position, and vertical position. Using a single table emphasized that time is the common parameter shared by both motion components.

Results

Part A. Generating Data for Modeling Parametric Equations

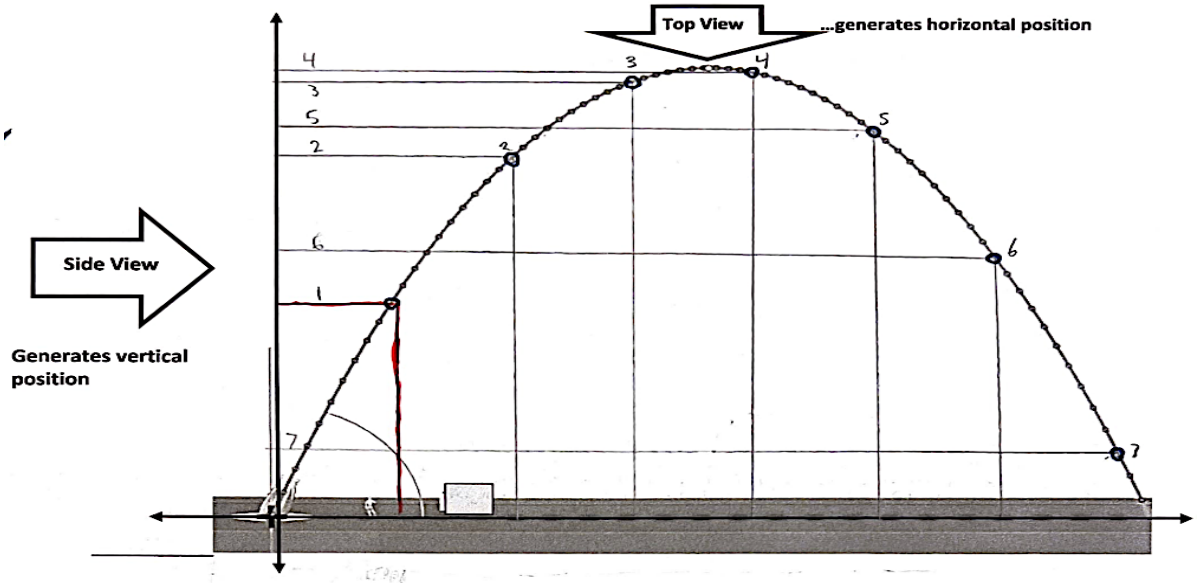
Using the trajectory, students projected the object’s position at each second on the y-axis using the side view and the x-axis using the top view (see Figure 6). They measured the coordinates and generated the data table.

Figure 6

Sample of Student's Work on Generating Data Table for Parametric Equations

The diagram depicts the path of a projected object.

- **The larger circular dots on the trajectory denote the object's position after every *second* of motion.**
- **The smaller circles show the position after every 0.1 sec. Ignore the angle of projection.**



- **Highlight all larger circles on the motion trajectory and draw vertical and horizontal axillary lines to be able to measure, using a ruler, the object's position in vertical and horizontal directions after each second of motion. You can label them e.g., 1, 2, etc. The lines in red are an example.**
- **Starting from the position (0,0) measure, using a metric ruler, the object's positions along the x and y directions separately. E.g. the position after 2 seconds in x-the direction is the separation between x=0 xm and the object's position after 2 sec in the x-direction.**
- **Generate a table with the x and y positions. Express the positions to the nearest decimal place (e.g., 3.1 cm)**

Table 1

1	Time (s)	0	1	2	3	4	5	6	7
2	x-position	0	2	4	6	8	10	12	14
3	y-position	0	4.5	7.5	9	9.25	8	5.25	2.5

The views to gather the data followed the previously established convention.

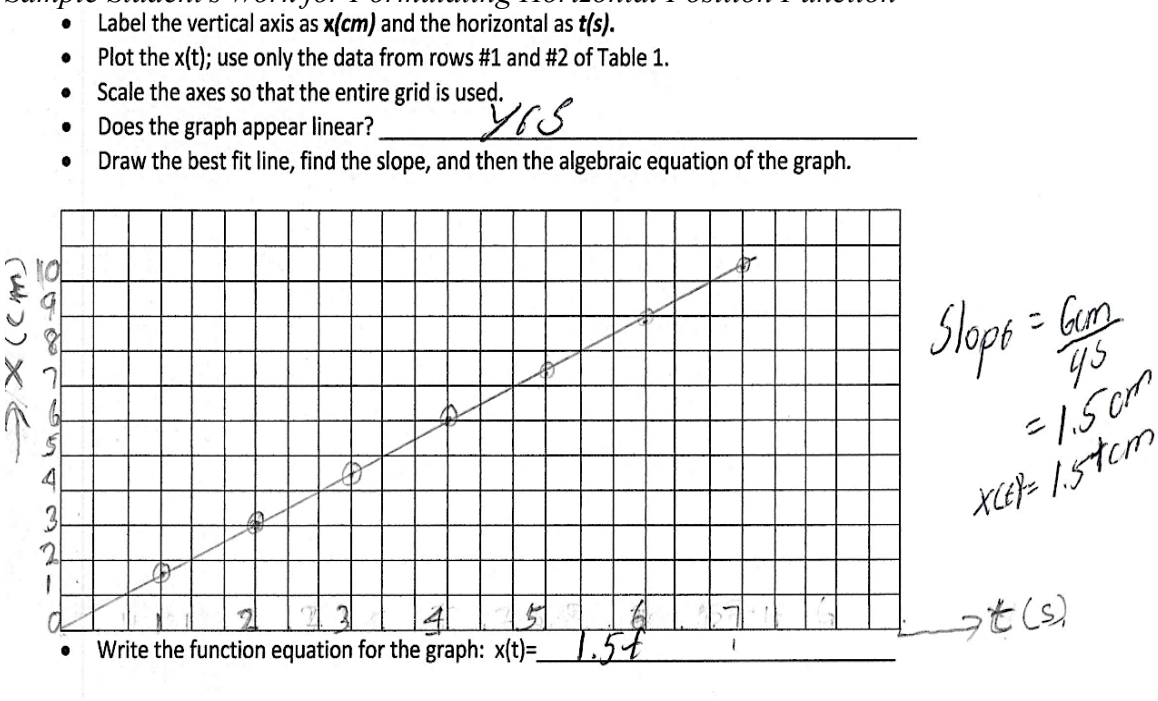
Students completed Table 1 and used the data to construct the graphs and functions $x(t)$ and $y(t)$. The table consisted of three rows: time, the x-position, and the y-position of the object from t = 0 s to t = 7 s.

Part B. Analysis of Motion Horizontal Component

Following the data collection phase, students analyzed the horizontal component of projectile motion to determine its mathematical characteristics. Using the time and horizontal-position data, students constructed *x(t),* identified its constant slope, and concluded that the horizontal velocity remained constant while the horizontal acceleration was zero (see Figure 7). They then sketched the corresponding velocity and acceleration functions.

Figure 7

Sample Student's Work for Formulating Horizontal Position Function



Using the generated graph, students identified a constant slope for the horizontal position function. From this observation, they concluded that:

- The horizontal velocity remained constant throughout the motion.
- Optional precision: The horizontal position function is linear.

Students also formulated and sketched the corresponding velocity and acceleration functions, recognizing that the velocity remained constant while the horizontal acceleration was zero throughout the motion.

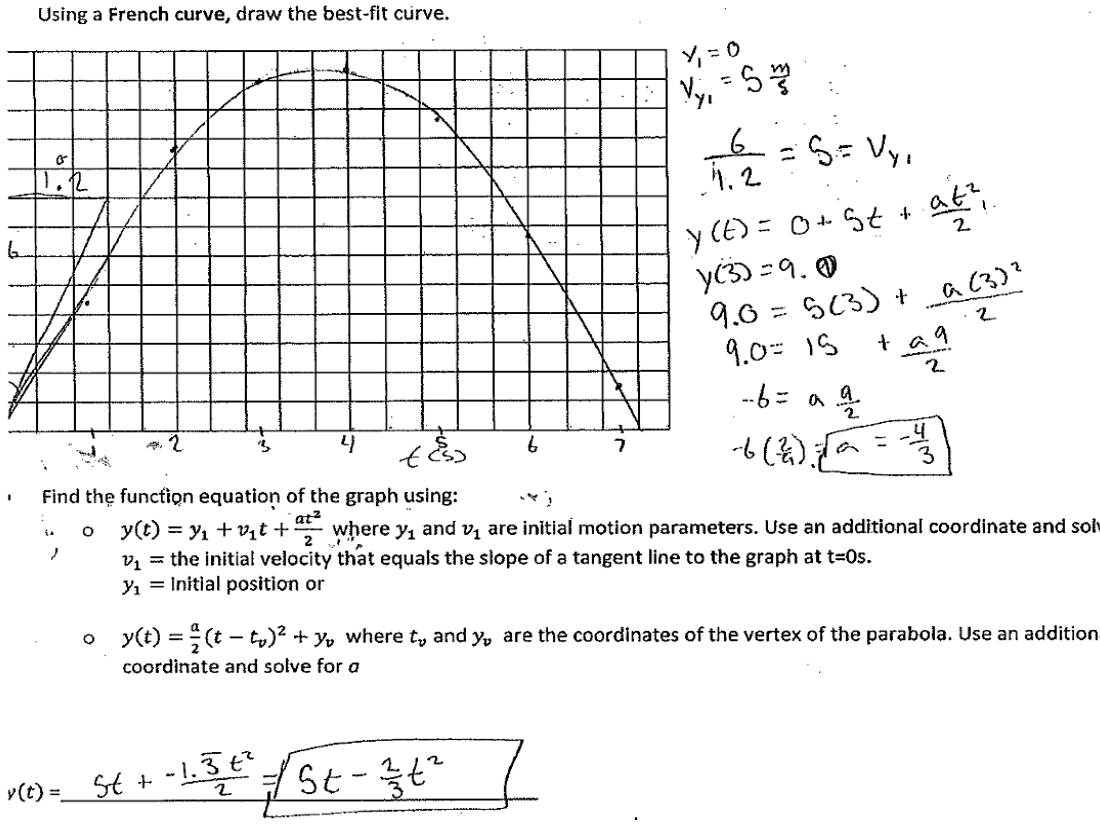
Part C. Analysis of the Vertical Component

After examining the horizontal component, students analyzed the vertical component to investigate the effects of constant gravitational acceleration on the motion.

Using the time and vertical-position data from Table 1, students generated the vertical position function, $y(t)$, and determined that it was parabolic.

Figure 8

Student's Work for Formulating Vertical Position Function



By analyzing the function's attributes, students identified the object's constant downward acceleration and formulated the corresponding vertical position function. They then constructed and sketched the associated velocity and acceleration functions.

Collectively, these activities enabled students to integrate algebraic structure, graphical interpretation, and physical meaning into a coherent mathematical representation of projectile motion.

Data Collection

Student learning was assessed using quantitative and qualitative measures. Quantitative data consisted of students' responses to conceptual kinematics tasks administered after the instructional intervention. Qualitative data were obtained from an open-ended survey question:

Which learning experience most helped you understand projectile motion as a combination of different algebraic functions?

Students selected one of three responses:

- Observation of classroom demonstrations
- The three-unit laboratory sequence
- Prior experiences outside the classroom

Students also provided written explanations to justify their selections.

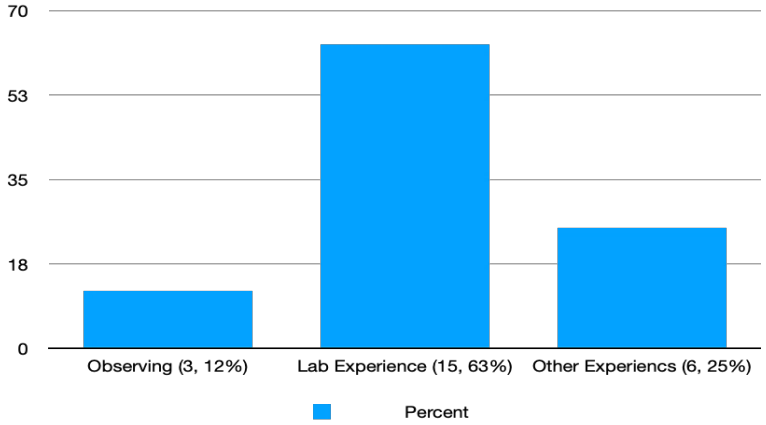
Data Analysis

Descriptive statistics summarized students' survey responses and performance on conceptual tasks. Written responses were analyzed thematically to identify evidence of students' understanding of functional decomposition, the independence of horizontal and vertical motion, and the interpretation of projectile motion using parametric equations. These analyses were used to evaluate the intervention's effectiveness in promoting model-based reasoning and conceptual understanding of two-dimensional motion.

Survey results indicated that the three-unit laboratory sequence had the greatest impact on students' conceptual understanding of projectile motion.

Figure 9

Distribution of Students' Survey Responses



Observation of Real Demonstrations (3, 12%)

Students in this group described observable features of projectile motion, such as the object slowing as it rises, momentarily stopping at its highest point, accelerating downward, and following a parabolic path. These responses suggest that demonstrations promoted descriptive observation rather than mathematical reasoning.

Three-Unit Laboratory Sequence (15 students, 63%)

Most students identified the laboratory activities as the most influential learning experience. Their explanations emphasized that the horizontal motion was represented by a linear function with constant velocity and zero acceleration, while the vertical motion was modeled by a separate function. Many specifically referred to parametric equations as helping them distinguish the independent horizontal and vertical components of projectile motion. Overall, these responses demonstrated strong integration of mathematical representations with physical interpretation. Students also cited the corresponding algebraic functions as evidence of the two-dimensional nature of projectile motion.

Experiences Outside the Classroom (6 students, 25%)

Students who selected this category referred to experiences such as sports, firing projectiles, or observing rolling objects. Although these experiences supported intuitive predictions about

projectile motion, they rarely involved constructing or interpreting formal mathematical models.

Overall, the survey findings indicate that the laboratory sequence most effectively promoted students' ability to connect graphical and algebraic representations with the physical interpretation of projectile motion through parametric modeling.

Discussion

Taken together, the classroom observations, students' written work, and survey responses indicate that the instructional intervention strengthened both students' mathematical modeling skills and their conceptual understanding of projectile motion.

The inquiry-based learning environment encouraged students to investigate motion by analyzing simulation-generated data rather than applying memorized equations. Constructing separate horizontal and vertical component functions helped students recognize projectile motion as the combination of two independent one-dimensional motions.

Students then translated these observations into parametric equations, treating them as mathematical models derived from empirical evidence rather than formulas to memorize. Constructing and graphing the corresponding position, velocity, and acceleration functions further strengthened their understanding by linking graphical features with the physical behavior of the projectile. Students associated the linear horizontal function with constant velocity and the quadratic vertical function with uniformly accelerated motion under gravity.

The intervention also strengthened the connection between mathematics and physics by showing how familiar mathematical concepts, including linear and quadratic functions, parameters, and function composition, describe physical phenomena. As a result, students increasingly viewed parametric equations as a natural framework for representing two-dimensional motion.

Overall, the findings suggest that introducing parametric modeling early in kinematics promotes conceptual understanding by integrating experimental observations, graphical representations, algebraic models, and physical principles. Beyond supporting computation, mathematical modeling served as an effective vehicle for scientific reasoning and the analysis of two-dimensional motion.

Conclusions

This study investigated the use of parametric equations to strengthen students' understanding of projectile motion through mathematical modeling. The findings suggest that introducing parametric equations early in kinematics provides an effective instructional approach for helping students interpret projectile motion as two-dimensional vector motion with independent horizontal and vertical components. By constructing parametric models from empirical data, students developed stronger connections between physical principles and their mathematical representations.

The instructional intervention also demonstrated that mathematical modeling could extend students' reasoning beyond traditional demonstrations. For example, students verified algebraically that projectiles with different horizontal velocities share identical vertical motion

and reach the ground simultaneously. This mathematical verification complemented experimental observations and reinforced the value of parametric equations as analytical tools for explaining physical phenomena.

More broadly, the study suggests that constructing mathematical models from empirical evidence encourages students to view functions as explanations of physical systems rather than formulas to memorize. As a result, mathematical reasoning became a means of interpreting motion, promoting conceptual understanding and supporting subsequent problem solving.

The study was exploratory and involved a single group of students; therefore, the findings should be interpreted cautiously. Future research should examine whether instruction based on parametric modeling leads to more effective and transferable problem-solving strategies than traditional approaches and whether these benefits extend to broader topics in two-dimensional kinematics and dynamics.

Study Limitations

Several limitations should be considered when interpreting these findings. First, the study involved a relatively small sample of 24 students, limiting the statistical power and generalizability of the results. Replication with larger and more diverse populations is needed to establish the robustness of the observed effects.

Second, the absence of a control group prevents attributing students' learning gains solely to the instructional intervention. Although the findings suggest that parametric modeling improved students' understanding of two-dimensional motion, other factors, including normal instructional progression and instructor effects, may also have contributed. Future studies employing experimental or quasi-experimental designs are needed to establish causal relationships.

Finally, the intervention was conducted over a relatively short period and did not examine the long-term retention or transfer of students' understanding to subsequent topics such as dynamics, work and energy, or rotational motion. Longitudinal studies would help determine the durability and transferability of these learning gains.

Despite these limitations, the findings provide preliminary evidence that integrating parametric equations into introductory kinematics is a promising instructional approach. Rather than offering definitive conclusions, this study serves as an initial step toward a more integrated understanding of these mathematical tools in physics.

Suggestions for Future Research

The findings of this study suggest several directions for future research. First, the instructional approach should be replicated with larger and more diverse student populations to evaluate its generalizability. Studies employing experimental or quasi-experimental designs with control groups would provide stronger evidence of the effects of integrating parametric equations into projectile motion instruction.

Future research should also examine the long-term impact of this approach by investigating whether students continue to use parametric equations when studying topics such as two-dimensional dynamics, circular motion, oscillatory motion, and other vector-based phenomena.

Such studies could determine whether early exposure to parametric modeling promotes a more integrated understanding of these mathematics tools in physics.

Additional studies should compare the effectiveness of different instructional settings, including traditional lectures, inquiry-based laboratories, simulations, and technology-supported modeling, while also examining how students with different levels of mathematical preparation respond to parametric modeling.

Finally, qualitative studies using classroom observations, interviews, and think-aloud protocols could provide deeper insight into how students develop connections between mathematical representations and physical concepts, informing future curriculum design and instructional materials.

References

Ainsworth, S. (2006). DeFT: A conceptual framework for considering learning with multiple representations. *Learning and Instruction, 16*(3), 183–198.

Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). Wiley.

Clement, J. (1982). Students' preconceptions in introductory mechanics. *American Journal of Physics, 50*(1), 66–71.

Das, C., & Roy, D. (2014). Projectile motion with quadratic damping in a constant gravitational field. *Resonance, 19*(5), 446–465.

Dilber, R., Karaman, I., & Düzgün, B. (2009). High school students' understanding of projectile motion concepts. *Educational Research and Evaluation, 15*(3), 203–222.

Eichenlaub, M., & Redish, E. F. (2019). Blending physical knowledge with mathematical form in physics problem solving. In E. F. Redish & E. Kuo (Eds.), *Mathematics in Physics Education* (pp. 127–151). Springer.

Espinoza, F. (2004). Enhancing mechanics learning through cognitively appropriate instruction. *Physics Education, 39*(2), 181–190.

Galilei, G. (1914). *Two new sciences*. Dover Publications. (Original work published 1638)

Gamble, R. (1989). Force. *Physics Education, 24*(2), 79–82.

Hidayatulloh, W., Kuswanto, H., Santoso, P. H., Susilowati, E., & Hidayatullah, Z. (2021). Exploring students' misconception in the frame of graphic and figural representation on projectile motion regarding to the COVID-19 constraints. *JIPF (Jurnal Ilmu Pendidikan Fisika), 6*(3), 243–253. https://doi.org/10.26737/jipf.v6i3.2157

Jäder, J., & Johansson, H. (2025). Exploring students' conceptual understanding through mathematical problem solving: Students' use of and shift between different representations of rational numbers. *Research in Mathematics Education*, 1–18. https://doi.org/10.1080/14794802.2025.2456840

Jamaludin, J., Batlolona, J. R., & Dulhasyim, A. B. P. (2025). Building new understanding through experiments: Students' conceptual shifts on projectile motion. *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram, 13*(4), 999–1021.

Jimoyiannis, A., & Komis, V. (2001). Computer simulations in physics teaching and learning: A case study on students' understanding of trajectory motion. *Computers & Education, 36*(2), 183–204.

Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new philosophical paradigm? *Educational Technology Research and Development, 39*(3), 5–14.

Klein, P., Gröber, S., Kuhn, J., & Müller, A. (2014). Video analysis of projectile motion using tablet computers as experimental tools. *Physics Education, 49*(1), 37–43.

Lesh, R., & Doerr, H. M. (Eds.). (2003). *Beyond constructivism: Models and modeling perspectives on mathematics problem solving, learning, and teaching*. Lawrence Erlbaum Associates.

Mihas, P., & Gemousakakis, T. (2007). Difficulties that students face with two-dimensional motion. *Physics Education, 42*(2), 163–170.

Millar, R., & Kragh, W. (1994). Alternative frameworks or context-specific reasoning? Children's ideas about the motion of projectiles. *School Science Review, 75*(272), 27–34.

Munfaridah, N., Avraamidou, L., Goedhart, M., & van den Berg, E. (2021). The use of multiple representations in undergraduate physics education: What do we know and where do we go from here? *Eurasia Journal of Mathematics, Science and Technology Education, 17*(1).

National Research Council. (2012). *A framework for K–12 science education: Practices, crosscutting concepts, and core ideas*. National Academies Press.

PhET Interactive Simulations. (n.d.). *Projectile Motion*. University of Colorado Boulder. https://phet.colorado.edu/sims/html/projectile-motion/latest/projectile-motion_all.html

Piaget, J. (1970). *Science of education and the psychology of the child*. Orion Press.

Redish, E. F., & Kuo, E. (Eds.). (2019). *Mathematics in Physics Education*. Springer.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin.

Shofiyah, N., Suprapto, N., Prahani, B. K., Jatmiko, B., Anggraeni, D. M., & Nisa', K. (2024). Exploring undergraduate students' scientific reasoning in the force and motion concept. *Cogent Education, 11*(1), 2365579.

Sokolowski, A. (2018). *Scientific inquiry in mathematics: Theory and practice from a STEM perspective*. Springer.

Sokolowski, A. (2020). Developing covariational reasoning among students using context formulas: Are the current formula notations in physics aiding graph sketching. *The Physics Educator, 2*(4), 2050016.

Sokolowski, A. (2021). *Parametrization of projectile motion. In Understanding physics using mathematical reasoning*. Springer.

Sokolowski, A. (2021). *Understanding physics using mathematical reasoning*. Springer.

Sokolowski, A. (2023). Constructing wave functions using mathematical reasoning. *The Physics Teacher, 61*(2), 124–127.

Sokolowski, A. (2025). *Modeling problem solving in physics with simulated experiments: Engaging lab activities*. Cambridge Scholars Publishing.

Sokolowski, A., & Capraro, M. M. (2013). Parametrization of motion. *Mediterranean Journal for Research in Mathematics Education, 12*(1–2), 121–133.

Springuel, R. P., Wittmann, M. C., & Thompson, J. R. (2007). Applying clustering to statistical analysis of student reasoning about two-dimensional kinematics. *Physical Review Special Topics–Physics Education Research, 3*(2), 020107.

Von Glasersfeld, E. (1991). Abstraction, re-presentation, and reflection: An interpretation of experience and Piaget's approach. In L. P. Steffe (Ed.), *Epistemological foundations of mathematical experience* (pp. 45–67). Springer.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wee, L. K., Chew, C., Goh, G. H., Tan, S., & Lee, T. L. (2012). Using Tracker as a pedagogical tool for understanding projectile motion. *Physics Education, 47*(4), 448–455.

Wieman, C. E., Adams, W. K., & Perkins, K. K. (2008). PhET: Simulations that enhance learning. *Science, 322*(5902), 682–683.

ESP for the Digital Age: Mixed-Methods Study on AI-Supported Gamified Soft Skills Training

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Abstract

This mixed-methods research explores how AI-supported, gamified soft skills training influences psychological well-being, learner motivation, and autonomy in tertiary English for Specific Purposes (ESP) instruction based on the 21st century need. The 13-week intervention, implemented with 60 undergraduate Economics students at the University of Žilina, Slovakia, was theoretically grounded in Seligman's PERMA model and conceptually aligned with the OECD Learning Compass 2030 pillars and the soft skills STEPS approach conceptual framework. This approach develops socio-emotional and metacognitive capacities through student-centred learning, teacher support, energy management, problem-solving, and stress management. Although most ESP studies have traditionally focused on linguistic and subject-specific competence, the purposeful integration of AI-driven tools for soft skills development remains underexplored. Quantitative data were collected using a 25-item Likert-scale questionnaire (pre/post design) and analysed using SPSS (M, SD, Cohen's d), while qualitative reflections from learner journals were thematically analysed using NVivo. Together, these data sources provided a multifaceted understanding of the affective and metacognitive impact of AI-based learning tools. The results revealed statistically significant improvements in all three domains: psychological well-being ($d = 0.89$), motivation ($d = 0.46$), and autonomy ($d = 0.27$). The findings confirm not only the pedagogical efficacy of AI-enhanced gamified learning but also its capacity to foster emotional stability, deeper engagement, and greater learner agency. This study contributes to ESP pedagogy by embedding emotional, cognitive, and metacognitive dimensions into instruction – a practical model for future-ready, holistic language education that supports the needs of digital-native learners moving beyond linguistic competence.

Keywords: ESP, PERMA model, OECD Learning Compass 2030, metacognition, AI-supported gamified tools

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Introduction

The 21st century marks a transformative era of AI-assisted learning, reshaping English for Specific Purposes (ESP) through the integration of advanced digital platforms (e.g., ChatGPT, Perplexity AI, Gemini, Claude) and AI tools leading to soft skills development that support personalised instruction, rising motivation and well-being in student-centred language acquisition and collaborative learning.

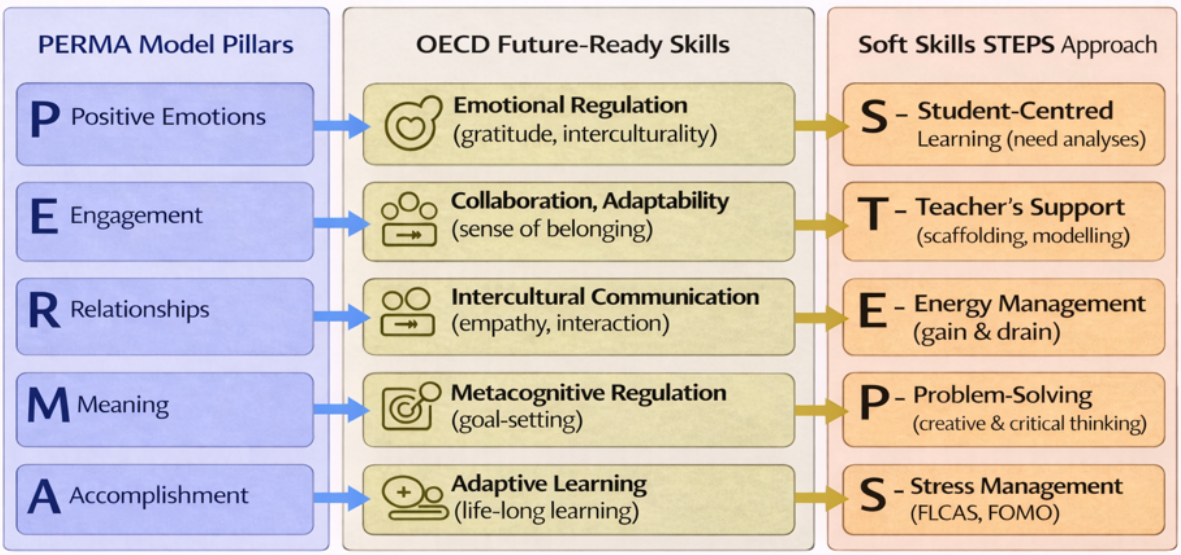
Integrative Conceptual Framework

The conceptual framework is guided by the STEPS five-element approach based on positive student-centred psychology, Seligman's PERMA model, adopting future-oriented educational paradigms of the OECD Learning Compass 2030. The goal is to enhance:

1. PERMA model defines well-being as the dynamic interaction of five dimensions: Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment (Seligman, 2011).
2. OECD Learning Compass 2030 emphasises emotional regulation, adaptability, metacognitive awareness, collaboration, multi-culti interacion and adaptive well-being as core competencies for lifelong learning and holistic development (OECD, 2020) toward healthier digital engagement and enhanced academic, emotional, and social outcomes. To reinforce the conceptual framework, three AI-supported digital tools were selected for a home assignment: Coach.me for habit tracking and goal setting, Daylio for emotional self-reflection, and SuperBetter for gamified resilience-building as supportive soft skills.
3. STEPS five-element approach is based on learners need, teachers' support dealing with energy, problem solving and stress management.

Figure 1 shows the integrative framework that links the PERMA well-being pillars to the OECD Future-Ready Skills through the ESP Soft Skills student-centred STEPS approach.

Figure 1
PERMA Model, OECD Skills and Soft-Skills STEPS Approach Framework



Note. FLCAS (Foreign Language Classroom Anxiety Scale), FOMO (Fear of Missing Out)

These three pillars integrate cognitive, emotional, and behavioural components into ESP. Positive psychology and affective pedagogy shows that emotionally engaging language instruction enhances enjoyment, memory, and long-term effectiveness (Dewaele & Hu, 2023; MacIntyre & Al-Hoorie, 2024). Embedding soft skills into pedagogical frameworks empowers learners to operate more effectively in real-world academic and professional contexts, extending learning outcomes beyond linguistic performance.

Literature Review

ESP in the twenty-first century systematically integrates interpersonal, behavioural, and emotional soft skills such as adaptability, self-regulation, and collaboration, competencies essential for sustainable professional success in global business world (McCabe et al., 2025; Mercer, 2021; Oxford, 2016). Emotionally engaging learning environments foster enjoyment and sustain motivation, while learner well-being is a condition for successful language acquisition (Dewaele & Hu, 2023; MacIntyre et al., 2024; Mercer, 2021). Within ESP contexts, emotional safety reduces anxiety and promotes engagement and motivation (Deci & Ryan, 2000; Dewaele & Hu, 2023; Seligman, 2011). The maintenance of positive conditions depends on metacognitive competence to plan, monitor, and evaluate their learning, developing autonomy, particularly in task-based, professional communication settings (Veenman, 2017).

At the same time, learner well-being drives motivation and long-term engagement, as reflected in Seligman's PERMA model (2011) and the OECD Learning Compass 2030 framework. Soft skills enhance both language learning and teaching by fostering communication, cooperation, adaptability, and emotional engagement (Elleuch, 2024), which were used in the ESP training.

The theoretical foundation of positive psychology, represented by Seligman's PERMA model, conceptualises well-being through five interconnected dimensions: Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment. These dimensions parallel the OECD Learning Compass 2030, which promotes future-ready competencies such as adaptability, collaboration, ethical reflection, and metacognitive awareness.

Metacognition plays a central role in learner-centred ESP instruction. Learners' awareness and regulation of their cognitive processes support autonomy through planning, monitoring, and evaluation, which is critical in task-based and professionally oriented ESP environments (Veenman, 2017).

Reflective AI-supportive gamified tools focused on journaling, habit tracking, and resilience-oriented tasks that foster emotional regulation, motivation, and sustainable behavioural change can strengthen metacognitive and affective dimensions.

Three AI-supported gamified tools were implemented:

- SuperBetter (resilience and motivation),
- Coach.me (habit tracking and goal setting),
- Daylio (emotional reflection)

These applications provided structured feedback, reflective prompts, and motivational mechanisms that promoted emotional stability, engagement, and self-regulated learning.

In the ESP course, soft skills were developed through reflective AI-supportive tools focused on journaling, habit tracking, and resilience-oriented tasks that fostered emotional regulation, motivation, and sustainable behavioural change. Daylio mobile application supported emotional awareness through mood tracking, Coach.me facilitated consistent habit formation and goal progress, and SuperBetter gamified motivation and stress management through challenges and feedback. Together, these selected tools cultivated a learner-centred environment that nurtured emotional stability, collaboration, and learner autonomy while reinforcing intercultural communication and self-efficacy through scaffolded, feedback-based learning.

Methodology

Intervention Design

The AI-Supported Gamified Soft Skills Training integrated a series of student-centred activities aligned with Seligman's PERMA model and the OECD Learning Compass 2030 competencies. Activities were designed to strengthen emotional intelligence, metacognitive awareness, and collaborative engagement. The key interventions included:

- Icebreakers, reflection tasks, and team-based activities to foster emotional readiness, gratitude, and cooperative learning.
- Role plays, peer feedback sessions, and project-based tasks to enhance engagement, social interaction, and task motivation.
- Self-assessment and progress tracking to build learner confidence and autonomy.

Table 1 summarises the three gamified AI-supported tools integrated into the training to enhance well-being (stress management), autonomy (self-regulation), and motivation (task engagement).

Table 1
Selected AI-Supported Gamified Tools for ESP Soft Skills Training

Tool/link	Key Characteristics	Educational Use in ESP
SuperBetter superbetter.com	Gamified well-being platform using quests, challenges, and power-ups	Builds resilience, supports stress management, fosters sustained motivation
Coach.me coach.me	Habit-tracking and goal-setting with progress monitoring	Reinforces learning consistency and supports individualised ESP learning
Daylio daylio.net	Visual self-reflection and mood tracking tool	Encourages emotional awareness, reflective learning, and self-motivation

Source: Authors

AI-gamified elements are effective when tasks are perceived as tailored, personalised, and adaptive (Klock et al., 2020), closely linked to the fulfilment of learners' psychological needs, particularly autonomy. Using them collectively helps create a holistic training framework for emotional stability, metacognitive engagement, and self-regulated learning.

Study Goals Objectives, and Hypothesis

This research examined three key learner development domains: well-being, motivation, and autonomy within an AI-enhanced ESP framework grounded in the PERMA, OECD and STEP models implemented in the research conceptual frameworks.

Table 2 summarises the research goals, objectives, and hypotheses that guided the study's design and analysis.

Table 2
Research Goals, Objectives, and Hypotheses

Goal	Objective	Hypothesis
Examine the impact of soft skills training on ESP learning outcomes.	Evaluate how soft skills training improves students' well-being in ESP.	H1: Soft skills training significantly enhances learners' psychological well-being via emotional safety in ESP.
Increase ESP learners' motivation and engagement through soft skills activities.	Assess the effect of motivationally aligned tasks on learners' engagement.	H2: Task-based soft skills training significantly improves learners' motivation and task engagement.
Foster learner autonomy via self-regulatory strategies.	Determine whether the soft skills training domains promote learner autonomy.	H3: Metacognitive and self-regulatory strategies significantly enhance learner autonomy in ESP learners.

Source: Authors

Research Design

A mixed-methods design investigated the effects of an intervention on psychological well-being, motivation, and autonomy, focusing on the main domain of an ESP course during the Winter Term 2025/26 at the University of Žilina, Slovakia. The program was involved in 13 weeks of semestral English instruction and was embedded as a part of weekly 100-minute ESP curriculum sessions together with hard skills training (professional PowerPoint presentations, implementing a topic-based glossary, grammar acquisition, quizzes, and criterion-based feedback, tests) and soft skills training as a part of each lesson.

Participants

Sixty Economics undergraduates at CEFR level B2 participated voluntarily. All consented according to university ethical standards (CEFR, Council of Europe, 2001). Participation in the study was voluntary and obtained with informed consent and ethical considerations.

Data Collection

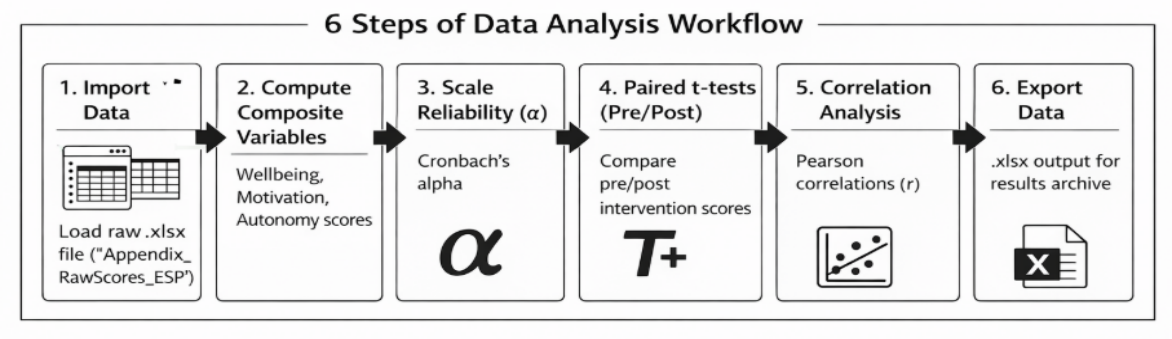
Quantitative data were collected using a 25-item pre-and post-intervention Likert-scale student-centred questionnaire (α = .87), adapted from validated frameworks: PERMA-Profiler (Butler & Kern, 2016), MSLQ (Pintrich et al., 1991), and Self-Determination Theory (Deci & Ryan, 2000), targeted PERMA, OECD, and STEPS dimensions and metacognitive variables of AI tools.

Qualitative data from learner journals and responses to two semi-open and five open-ended questions were analysed through thematic coding in NVivo to capture affective themes. Qualitative data were obtained from reflective learning journals and from responses to 2 half-open-ended and 5 open-ended items in the collected pre-post questionnaire. These were analysed thematically using qualitative coding procedures in NVivo.

Data Analysis

Quantitative data were analysed using SPSS in a six-step workflow (Fig. 3). Paired-samples t-tests were conducted to compare pre- and post-intervention scores across the three domains. Effect sizes were reported using Cohen's *d*_z. The results indicated statistically significant improvements across all three measured dimensions.

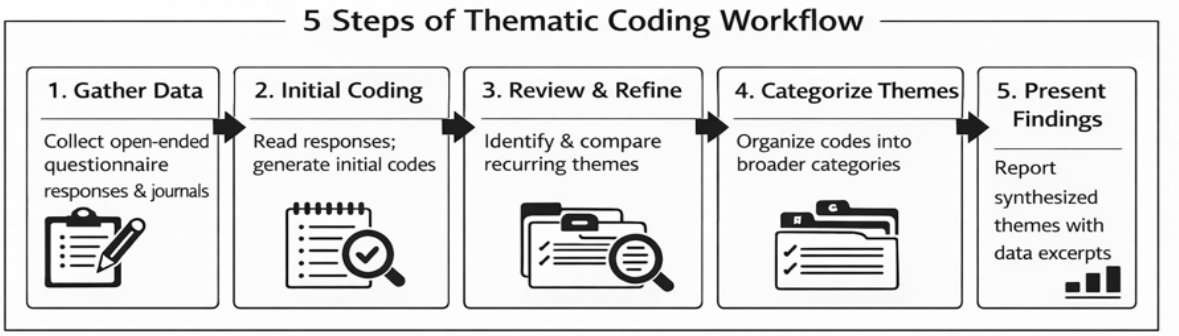
Figure 2
Six Steps of Quantitative Data Analysis



Source: Authors

Qualitative data were analysed thematically using qualitative coding procedures (Fig. 3).

Figure 3
Five Steps of Quantitative Data Analysis



Source: Authors

Results

Quantitative Findings

The intervention led to improvements across all three measured domains, as shown in Table 3. The most notable improvement was observed in psychological well-being, yielding a **large** effect size (d = 0.89). Although the mean gain was moderate (+0.41), the low variability in participant responses contributed to a consistent and statistically significant outcome ($t(59)$ =

3.40, $p < .001$). This indicates that the intervention had a substantial and homogeneous impact on learners' emotional safety, resilience, and perceived satisfaction.

Motivation showed a moderate effect ($d = 0.46$), reflecting measurable gains in learners' task engagement and perceived relevance of learning activities. Despite a relatively smaller mean gain (+0.25), the statistical significance ($p = .015$) and consistency of response patterns support the intervention's ability to positively influence motivational states in an ESP context. Autonomy, while yielding the smallest effect ($d = 0.27$), still showed a statistically significant improvement ($p = .001$). This indicates that gains in learners' self-regulatory behaviours and decision-making capacity were present but more gradual, suggesting that autonomy may require longer-term development beyond the scope of the instructional program. These findings align with Cohen's (1988) conventional thresholds: $d \approx 0.2$ is considered small, $d \approx 0.5$ is medium, and $d \geq 0.8$ is large. Overall, the intervention was most effective in enhancing learners' emotional well-being, with moderate success in boosting motivation and initial, though meaningful, effects on learner autonomy.

Table 3
Quantitative Analyses of Pre- and Post-questionnaire Results

Domain-based Hypothesis	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Gain	t-value	p-value (2-tailed)	Effect Size (Cohen's d)
Well-being (H1)	3.44 (0.45)	3.85 (0.44)	+0.41	3.40	< .001	0.89 (large)
Motivation (H2)	3.45 (0.45)	3.70 (0.41)	+0.25	2.50	.015	0.46 (medium)
Autonomy (H3)	3.43 (0.48)	3.59 (0.47)	+0.16	3.38	.001	0.27 (small)

Source: Authors
Note. Paired-samples t-test (df = 59)

Qualitative Findings

Qualitative data were analysed thematically using NVivo software, employing in vivo coding to capture participants' authentic expressions and recurring patterns. The analysis revealed strong associations between learner experiences and the use of specific AI-supported tools. Reflective tracking tools enhanced emotional awareness and regulation; habit-tracking applications facilitated goal setting and behavioural consistency; and gamified, collaborative tools fostered motivation, resilience, and social interaction. These findings underscore the complementary role of AI-supported tools in addressing the emotional, motivational, behavioural, and social dimensions of ESP learning. Quotes reflected mostly these patterns:

1. Emotional Regulation and Awareness. Students frequently described increased emotional self-awareness and control when using reflection-based tools. As one participant wrote, "*Using Daylio helped me notice patterns in my moods and how they affected my study habits.*" Others highlighted emotional resilience: *"SuperBetter made me more aware of how small positive actions can reduce my stress before lessons."* These reflections indicate that digital tracking supported both affective regulation and self-understanding.

2. Motivational Engagement. Motivation was strengthened by feedback loops and gamification. Learners reported that *"gamified tasks in SuperBetter kept me motivated even on busy days,"* while others noted that *"recording progress in Daylio gave me a sense of*

consistency; it reminded me why I started this course." These statements reflect sustained engagement and intrinsic motivation fostered through regular feedback and self-monitoring.

3. Learner Autonomy and Self-Regulation. Participants emphasised how AI tools promoted self-directed learning habits. As one student noted, *"With Coach.me, I could monitor my study routines and adjust them independently."* Another expressed, *"I realised how much control I have over my learning once I started tracking my progress."* Such reflections reveal growing metacognitive awareness and learner autonomy in ESP.

4. Sense of Achievement and Progress. Across journals, learners expressed satisfaction with visible progress: *"Each completed task in SuperBetter felt like a reward — I could see my growth week by week."* Similarly, *"Coach.me made my improvement visible; that visibility gave me confidence."* This sense of accomplishment reinforced persistence and self-efficacy in their learning process.

5. Social Interaction and Prosocial Behaviour. Finally, collaboration and peer support emerged as central themes. Students appreciated the social aspects of AI tools: *"Collaborating in SuperBetter challenges strengthened our class community,"* and *"I learned that motivation grows when you support others — teamwork made learning less stressful."* Such experiences suggest that shared digital environments foster a sense of belonging and collective resilience.

Table 4 shows that integrating AI-supported tools such as Daylio, SuperBetter, and Coach.me aligns with key qualitative categories, demonstrating their complementary roles in research.

Table 4
Qualitative Coding Categories and AI-Supported Tool Contributions to ESP Learning

Qualitative Coding Category	AI Tool(s)	Tool-Specific Contribution to ESP Learning
Emotional Regulation and Awareness	Daylio, SuperBetter	Daylio supports mood tracking and reflection; SuperBetter builds emotional resilience through gamified tasks.
Motivational Engagement	SuperBetter, Daylio	SuperBetter gamifies motivational goals; Daylio maintains daily emotional and motivational awareness.
Learner Autonomy and Self-Regulation	Coach.me, Daylio	Coach.me facilitates habit tracking; Daylio promotes self-reflection and consistent self-monitoring.
Sense of Achievement and Progress	Coach.me, SuperBetter	Coach.me offers progress tracking, while SuperBetter provides feedback through "power-ups" and achievement tasks.
Social Interaction and Prosocial Behaviour	SuperBetter, Coach.me	SuperBetter encourages team quests and resilience, while Coach.me offers community support and peer feedback.

Source: Authors

Overall, the qualitative findings suggest that integrating AI-supported tools significantly complements ESP learning by strengthening learners' emotional regulation, increasing intrinsic motivation, supporting autonomous learning, and encouraging meaningful social interaction.

Integration and Interpretation

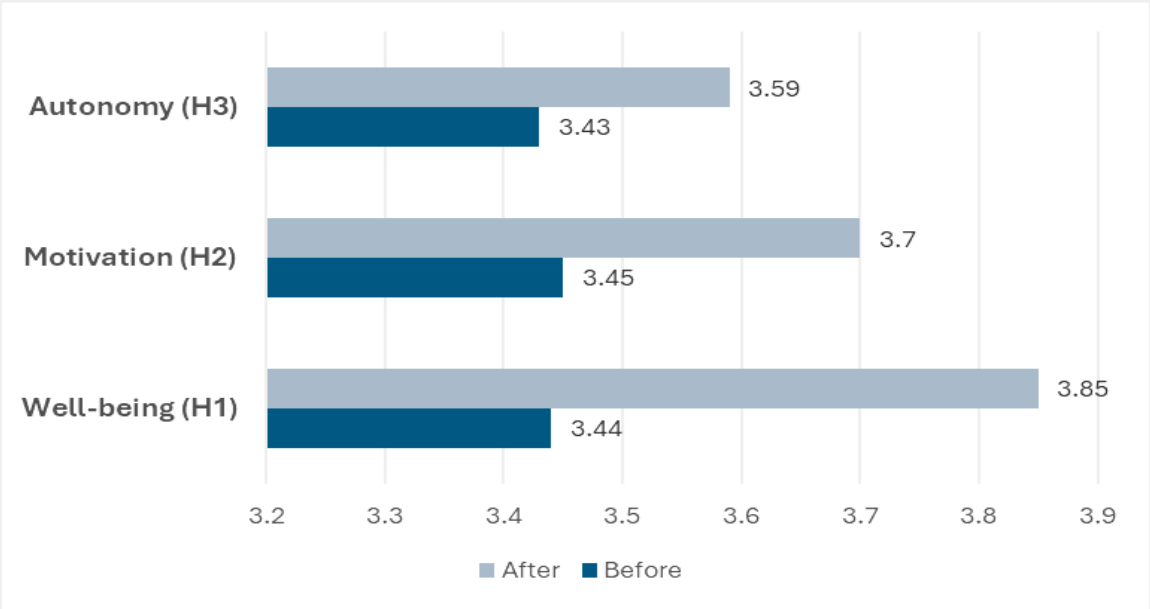
Both quantitative and qualitative results confirmed all hypotheses (H1–H3) concerning learners' psychological well-being (H1), motivation (H2), and autonomy as a form of metacognitive self-regulation (H3). Gamified AI/supported platforms promoted sustained motivation via rewarding, feedback-rich activities; well-being improved through emotional stability and peer support; autonomy developed progressively through reflective self-regulation. These findings align with prior studies of researchers in this field (Bai & Li, 2024; Gkonou & Mercer, 2022; Vansteenkiste et al., 2020) and indicate that technology-enhanced feedback fosters emotional resilience and motivation in EFL and ESP contexts.

Visual Comparison of Pre- and Post-intervention Results

Among the three measured domains, motivation emerged as the most responsive, indicating that interactive, feedback-rich learning environments enhanced by AI tools significantly increased all dimensions and showed marked improvement following the intervention.

Figure 4 illustrates a bar graph comparing pre-intervention and post-intervention scores across the three measured domains: motivation, well-being, and autonomy. The most pronounced improvement was observed in motivation, followed by well-being and autonomy. The consistency of these results provides empirical support for the effectiveness of AI-supported gamified tools in fostering learner engagement, emotional security, and autonomous self-regulation in ESP environments.

Figure 4
Pre-and Post-intervention Mean Scores Comparison (5-Point Likert Scale)



Source: Authors

The trends presented in Figure 4 were statistically confirmed, providing empirical support for all three hypotheses. The analysis revealed a statistically significant increase in the post-intervention mean values for autonomy (H3), motivation (H2), and well-being (H1).

Discussion, Limitations, and Conclusion

The findings demonstrate that integrating AI-supported gamified tools into soft-skills training can substantially enhance learners' psychological well-being, motivation, and autonomy in tertiary ESP instruction. Among the three domains examined, motivation emerged as the most responsive to the intervention, underscoring the influence of interactive, feedback-rich, and goal-oriented environments on sustained learner engagement and task focus. These results are consistent with previous research on AI-enhanced language learning (e.g., Bai & Li, 2024; Gkonou & Mercer, 2022), which confirms that technology-mediated feedback can strengthen both motivation and emotional resilience.

Improvements in psychological well-being suggest that the intervention fostered an emotionally safe and supportive classroom climate, a crucial factor in building students' sense of belonging and promoting active participation. The more moderate gains in autonomy reflect the inherently gradual development of self-regulatory and metacognitive capacities, which typically require extended practice and guided reflection. These findings align with Self-Determination Theory (Deci & Ryan, 2017; Vansteenkiste et al., 2020), indicating that motivation tends to respond rapidly to supportive pedagogical interventions, whereas autonomy and emotional resilience develop more gradually.

Despite these promising outcomes, several limitations should be acknowledged. First, the relatively short duration of the intervention (13 weeks) may have constrained the full development of autonomy-related outcomes. Second, the study relied primarily on self-reported measures, which are inherently susceptible to perceptual and social desirability biases. Finally, the absence of a control group limits direct comparison with traditional ESP instruction and reduces the ability to fully isolate intervention effects.

Future research should examine the long-term impact of AI-supported soft skills training on learner development; incorporate control or comparison groups to strengthen causal inference; explore discipline-specific adaptations of the framework across diverse tertiary contexts; and investigate the transferability of skills to real-world environments.

Ethical Considerations

The study followed the ethical standards of the University of Žilina Research Ethics Committee. Participation was voluntary, and informed consent was obtained from all participants prior to data collection. All responses were anonymised and used solely for research purposes in accordance with GDPR regulations.

Conclusion

This study provides empirical evidence that integrating AI-supported, gamified tools into ESP instruction can meaningfully enhance learners' motivation and psychological well-being. The results confirm that such interventions foster not only linguistic competence but also emotional and self-regulatory capacities. Motivation emerged as the most responsive, feedback-rich, and goal-oriented domain in sustaining learner focus. Improvements in well-being indicate that the intervention created an emotionally safe and supportive learning climate that encouraged reflection and collaboration. Autonomy, though developing more gradually, showed measurable gains, confirming that metacognitive and self-regulatory skills require continuous, guided practice.

By aligning the conceptual framework and applying digital tools such as Coach.me, Daylio, and SuperBetter, this study introduces a pedagogically grounded framework for AI-enhanced ESP. The findings support a shift from purely linguistic-focused curricula toward holistic, soft-skills–infused approaches that nurture lifelong learning capacities. For today's digital-native students, technology is deeply embedded in social and relational practices. Therefore, educational systems must develop learners' ability to critically interpret information from diverse digital sources while maintaining a balance between technological engagement and personal well-being (Benvenuti et al., 2023).

Overall, the study contributes to the growing body of evidence advocating for integrative, future-ready ESP pedagogy that harmonises emotional, cognitive, and behavioural dimensions of learning to prepare students for the challenges of the digital era.

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References

Benvenuti, M., Wright, M. F., Naslund, J. A., & Miers, A. G. (2023). *How the use of technology is changing adolescent behaviour and their social, physical, and cognitive development.* Current Psychology, *42*, 16466–16469. https://doi.org/10.1007/S12144-023-04254-4

Butler, J., & Kern, M. L. (2016). The PERMA-Profiler. *International Journal of Wellbeing, 6*(3), 1–48. https://doi.org/10.5502/ijw.v6i3.526

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). Lawrence Erlbaum Associates. ISBN 978-0-8058-0283-2

Council of Europe. (2001). *Common European Framework of Reference for Languages: Learning, teaching, assessment.* Cambridge University Press.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E. L., & Ryan, R. M. (2017). *Intrinsic motivation and self-determination in human behaviour.* Springer.

Dewaele, J. M., Gkonou, C., & Mercer, S. (2019). *The emotional rollercoaster of language teaching.* Multilingual Matters.

Dewaele, J. M., & Hu, Y. (2023). Boredom in foreign language learning: Conceptualisation and measurement. *Applied Linguistics Review, 14*(2), 223–249. https://doi.org/10.1515/applirev-2022-0026

DQ Institute. (2022). Digital well-being. *Centre for Trusted Internet and Community (NUS CTIC) & DQ Institute.* Retrieved February 12, 2025, from https://www.dqinstitute.org/digital-wellbeing

Elleuch, S. (2024). The role of soft skills in enhancing language learning and teaching. *Journal of Language and Education Development, 11*(2), 45–60.

Klock, F., Smith, J., & Lee, A. (2020). Learner engagement and gamification in adaptive education. *Journal of Educational Technology, 15*(2), 123–140. https://doi.org/10.1234/jet.2020.5678

MacIntyre, P. D., & Al-Hoorie, A. H. (2024). *Contemporary language motivation theory: 60 years and counting.* Multilingual Matters. https://doi.org/10.21832/9781800416780

McCabe, J. A., Jean, B. D. S., DeKoven, J. A., & Lees, M. S. (2025). Exploring the influence of syllabus design and academic support on student motivation and psychological well-being. *Scholarship of Teaching and Learning in Psychology.* https://doi.org/10.1037/stl0000366

Mercer, S. (2021). Language learner well-being across the lifespan. In K. Sato & S. Loewen (Eds.), *The Routledge handbook of the psychology of language learning and teaching* (pp. 205–217). Routledge. https://doi.org/10.4324/9781003051263-18

OECD. (2020). *The future of education and skills: OECD Learning Compass 2030.* OECD Publishing. https://doi.org/10.1787/0d1c9b54-en

Oxford, R. L. (2016). *Teaching and researching language learning strategies: Self-regulation in context* (2nd ed.). Routledge. https://doi.org/10.4324/9781315719146

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ).* University of Michigan.

Seligman, M. E. P. (2011). *Flourish: A visionary new understanding of happiness and well-being.* Free Press.

Vansteenkiste, M., Ryan, R. M., & Soenens, B. (2020). Basic psychological need theory: Advancements, critical themes, and future directions. *Motivation and Emotion, 44*, 1–31. https://doi.org/10.1007/s11031-019-09818-1

Veenman, M. V. J. (2017). Learning to self-monitor and self-regulate. In D. H. Schunk & J. A. Greene (Eds.), *Handbook of self-regulation of learning and performance* (2nd ed., pp. 197–210). Routledge. https://doi.org/10.4324/9781315697048-13

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Teaching Students to Prove: An International Comparative Analysis of Geometry and Algebra Textbooks

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Abstract

This paper presents findings from an international comparative study of secondary-school mathematics textbooks, with a particular focus on Geometry and Algebra. Given the broad scope of such a comparison, the analysis is limited to two representative topics: proofs related to triangle congruence in Geometry and proofs of selected algebraic formulas. The study examines textbooks from four countries and publishers: the United States (McDougal Littell), France (Hatier), Germany (Ernst Klett Verlag), and Italy (Atlas). The comparison identifies similarities and differences in content organization, instructional design, and pedagogical approaches, with particular emphasis on the presentation, purpose, and role of mathematical proof. In addition, the paper explores opportunities to integrate traditional printed textbooks with online lessons and other digital learning resources to enhance mathematics instruction. Based on the comparative analysis, recommendations are proposed for the development of future secondary-school mathematics textbooks and instructional materials. The study is further informed by the authors' more than twenty years of combined experience teaching secondary mathematics in the Houston Independent School District (HISD), USA, providing practical insights into the role and implementation of mathematical proofs in high-school mathematics courses.

Keywords: mathematics education, mathematical proof, textbook analysis, comparative education, secondary-school mathematics

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Introduction and Theoretical Framework

In recent years, numerous studies have undertaken international comparisons of mathematics education and instructional materials, examining a variety of curricular and pedagogical perspectives. One area of research has focused on cultural differences in the implementation of similar mathematical tasks across countries. For example, Clivaz and Miyakawa (2020) compared classroom practices in Switzerland and Japan, demonstrating how similar mathematical activities may be presented and implemented differently across educational contexts.

Another important line of research concerns the role of mathematical proof in contemporary school mathematics (Miyakawa, 2012; Miyakawa & Herbst, 2007). These studies show that, in both France and Japan, formal mathematical proofs are often replaced by empirical verification, discussions of evidence, or activities intended to convince students of the validity of a statement. Rather than proving fundamental mathematical properties, students are frequently asked to justify simple consequences of definitions or previously established theorems.

The teaching of mathematical proof has also been investigated from the perspective of teachers' mathematical knowledge and classroom practices. Knuth (2002) and Wiworo (2021) reported that some teachers experience difficulties constructing formal proofs or avoid presenting proofs directly in classroom instruction. Other comparative studies have examined the treatment of triangle congruence in Chinese and U.S. textbooks (Lo et al., 2021). These studies describe approaches for helping students recognize and justify triangle congruence through interactive discussions and validation activities; however, explicit formal proofs of congruence theorems are often limited or absent.

Comparative textbook research has also explored the organization and sequencing of mathematical content. Mironychev (2015) compared geometry textbooks from the United States, Mexico, and Russia, finding that courses may be organized either around the properties of geometric objects (e.g., lines, segments, triangles, and circles) or around the logical relationships among concepts and theorems. Fujita and Jones (2008) conducted a comprehensive analysis of Japanese mathematics textbooks and observed that formal proofs are often presented with limited explanatory support, which may create challenges for students' understanding of mathematical reasoning. Similarly, Prytz (2007) examined Scandinavian mathematics textbooks and discussed the connections among educational goals, curriculum requirements, textbook content, and the role of mathematical proof.

These studies indicate a broader trend in contemporary mathematics education: formal proofs of fundamental geometric properties and algebraic formulas are increasingly supplemented or replaced by empirical verification and intuitive justification. While these approaches may support accessibility and conceptual exploration, they may also limit students' opportunities to develop rigorous mathematical reasoning and proof-writing skills, which are essential for advanced study in mathematics, science, engineering, and related fields.

The present study investigates the treatment of mathematical proof in secondary-school mathematics textbooks from the United States, France, Germany, and Italy. Specifically, it examines how proofs of fundamental geometric theorems and selected algebraic formulas are presented and the pedagogical roles they serve within each textbook. The study uses comparative textbook analysis as its methodological framework, focusing on representative

topics in Geometry and Algebra. One textbook from each country was selected for analysis. Although this sample is not intended to be statistically representative, it provides an initial basis for identifying similarities and differences among national approaches and establishes a foundation for future, more comprehensive comparative studies.

Curriculum and Textbooks for Mathematics Courses

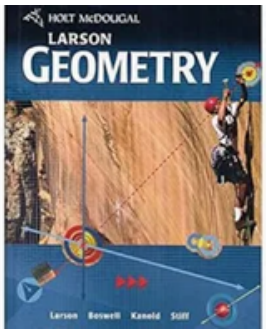
Despite the wide variety of educational and instructional materials available through the Internet, school districts, and educational organizations, these resources are generally grounded in the theoretical foundations and curricular expectations of national education systems. These foundations are reflected in mathematics textbooks developed by different publishers, which serve as important resources for classroom instruction.

For the analysis of mathematical proofs, the present study selected representative secondary-school mathematics textbooks from four countries: the United States (Larson et al., 2017), France (Chapiron et al., 2012), Italy (Vacca et al., 2021), and Germany (Lambacher & Schweizer, 2020). Table 1 provides a brief summary of the selected textbooks and the corresponding mathematics courses in each country.

Table 1
Study of Geometry and Math Curriculum in the High School of Countries

USA: McDougal Littell	**France**: Hatier	**Italy**: Atlas	**Germany**: Klett Verlag
Algebra I – 9 grade	Triangles 3 – 50/320 p.	Geometria 1 – 384 p.	Mathematik 7 – 30/291 p.
Geometry – 10 grade, 900 p.	Triangles 4 – 100/300 p.	Geometria 2 – 336 p.	Mathematik 8 – 30/200 p.
Algebra II – 11 grade	Triangles 5 – 108/256 p.	Geometria 3 – 363 p	Mathematik 9 – 94/250 p.

Figure 1
American Textbook on Geometry Published by McDougal Littell, 2007



In the United States, a high-school Geometry course (see the Fig. 1) is typically taught as a one-year course in Grade 10, following Algebra I. Students generally receive instruction through either two 90-minute lessons or four 45-minute lessons per week. Due to the flexibility of the U.S. education system, some students may complete Geometry in Grade 9 if they have already earned credit for Algebra I during middle school.

Despite the rapid expansion of online educational resources, the structure and content of Geometry curricula in the United States continue to reflect many features of traditional pre-COVID textbooks, including those published by McDougal Littell, Holt, Pearson, and Glencoe. The present analysis is based on the *McDougal Littell Geometry* textbook (Larson et al., 2011). The textbook contains approximately 900 pages and covers 12 chapters addressing major topics in plane and solid Geometry. These topics include fundamental definitions, proofs, parallel and

perpendicular lines, triangles, circles, three-dimensional figures, and area and volume. In addition to Geometry. After Geometry, in grade 11, students study Algebra II.

In France, Geometry is not taught as a separate subject (see the Fig. 2); instead, students study a unified mathematics course (*Mathématiques*) that includes different modules of Geometry integrated throughout the curriculum. The organization and emphasis of Geometry topics vary by grade level and textbook. For example, in the *Mathématiques* textbook series (see Table 1) published by Hatier (Chapiron et al., 2012), the Grade 5 volume contains 256 pages, of which approximately 107 pages (two chapters) are devoted to Geometry. The *Triangle 4* textbook contains 304 pages, with approximately 100 pages dedicated to Geometry, while *Triangle 3* includes 63 Geometry pages out of a total of 300 pages. The distribution of Geometry content reflects the integrated structure of the French mathematics curriculum, in which geometric concepts are developed alongside other areas of mathematics rather than organized as a separate course.

Figure 2
French Textbook on Geometry Published by Hatier

The Italian Geometry curriculum (Vacca et al., 2017) is presented through a three-volume textbook series (see the Fig. 3). The first volume (approximately 380 pages; 800 g) covers measurements of length, fundamental geometric concepts, parallel and perpendicular lines, and the properties of triangles and polygons (see Table 1). The second volume (approximately 330 pages; 700 g) focuses on circles and inscribed and circumscribed polygons. The third volume (approximately 260 pages; 590 g) addresses three-dimensional figures and introduces the use of software for constructing and exploring geometric objects in both the plane and space.

Figure 3
Italian Textbook on Geometry Published by Atlas

In Germany, the mathematics curriculum is presented through the textbook series *Mathematik für Gymnasien 7–10* (see Fig. 4), published by Ernst Klett Verlag (Lambacher & Schweizer, 2020). Each volume contains selected chapters devoted to Geometry rather than a separate Geometry course (see Table 1). The Grade 7 textbook includes a chapter on triangles (30 pages out of 290 pages).

Figure 4
German Textbook on Math Published by Klett Verlag

The Grade 8 textbook contains a chapter on similar figures (30 pages out of 200 pages). The Grade 9 textbook devotes 74 pages (out of 250 pages) to circles and right triangles, including the Pythagorean Theorem. The Grade 10 textbook includes a chapter on algebraic methods in Geometry, comprising 20 pages out of 180 pages. The majority of the content in these textbooks is devoted to Algebra and related mathematical topics.

Types of Proofs in High School Curricula

Several proof formats are commonly used in high-school Geometry. One method establishes the validity of a statement by demonstrating that the conclusion follows logically from given conditions and previously established results. This approach is known as the direct method of proof. Another method begins by assuming that the statement to be proven is false and then showing that this assumption leads to a contradiction. This approach is referred to as the indirect method of proof.

Within these general approaches, several formats are commonly used to represent mathematical arguments. The first is the paragraph (or narrative) proof, which presents a sequence of sentences describing the logical steps of an argument. This format resembles an essay in which reasoning is expressed through connected explanations. Many classical proofs from antiquity follow this structure. For example, Euclid (2016, p. 247) presents a proof of the Side-Angle-Side (SAS) congruence theorem for triangles (circa 300 BC) using a narrative format. The second format is the two-column proof, in which mathematical statements are presented in one column and their corresponding justifications are provided in another. This format emphasizes the relationship between claims and reasons and is widely used in secondary mathematics education in the United States (McDougal Littell, 2017).

A third format is the flow-chart proof, which represents the logical structure of an argument through connected statements and implications (McDougal Littell, 2017, p. 250). This format can support classroom discussions, collaborative work, and visual representation of mathematical reasoning.

In contemporary classroom practice, formal geometric proofs and algebraic derivations are sometimes supplemented by activities designed to verify the validity of mathematical statements. Such activities may involve measurement, hands-on exploration, or numerical examples. While these approaches can support conceptual understanding and student engagement, they do not replace formal mathematical justification. Effective instruction requires a balance among exploration, discussion, and rigorous proof.

Contemporary Classroom Practice

Current educational expectations emphasize several principles of effective classroom instruction, including efficient use of instructional time, active student engagement, student-centered learning, and opportunities for collaborative work. These principles are frequently included in teacher evaluation frameworks and classroom observation criteria used by schools and educational organizations.

Another important expectation of contemporary mathematics education is the connection between classroom learning and real-world applications. Students are encouraged to understand how mathematical concepts can be applied to authentic situations and practical problems.

These instructional priorities, combined with limited classroom time and increasing curricular demands, may influence the extent to which teachers include formal proofs of theorems in Geometry and derivations of formulas in Algebra. As a result, some mathematical justifications may be replaced by applications, examples, or problem-solving activities. The present study examines ways to reintegrate proofs and formula derivations into regular classroom practice while maintaining student engagement and conceptual understanding.

Proof of Congruent Triangles

The study of congruent triangles is a fundamental component of secondary-school Geometry curricula. Most high-school Geometry courses introduce several major congruence criteria for triangles, including Side-Angle-Side (SAS), Angle-Side-Angle (ASA), Angle-Angle-Side (AAS), Side-Side-Side (SSS), and Hypotenuse-Leg (HL) for right triangles. Additional congruence relationships involve special cases of isosceles and equilateral triangles, as well as configurations involving altitudes, angle bisectors, and medians.

Curricula in different countries approach the teaching and justification of triangle congruence in different ways. Some emphasize formal proofs and logical deduction, whereas others focus more heavily on exploration, visualization, and verification activities. The present study compares how congruence proofs are presented in secondary-school mathematics textbooks from different countries and examines the role assigned to formal mathematical reasoning.

Table 2 below summarizes approaches adopted in different countries.

Table 2
Statements About Congruent Triangles

Statement	**USA**: McDougal Littell	**France**: Hatier	**Italy**: Atlas	**Germany**: Klett Verlag
SAS	Postulate	No topic	Criterio, not proved	Statement
ASA	Postulate	No topic	Criterio, not proved	Statement
AAS	Proved theorem	No topic	Criterio, not proved	Statement
SSA	skipped	skipped	skipped	Statement

In the *McDougal Littell Geometry* textbook (Larson et al., 2017), the statements concerning triangle congruence, including SAS, ASA, and SSS, are presented as postulates. The AAS statement is introduced as a theorem; however, its proof is not developed in the textbook. Instead, students are asked to complete the proof as an example of a flow-chart proof (Larson et al., 2017, p. 250). It is worth to mention that in younger generation of American textbooks, statements SAS, ASA, and SSS were considered as theorems with proofs (Seymour, 1925).

In the set of French textbooks published by Hatier (Volumes 3, 4, and 5, including sections related to triangles), available to the authors, statements about triangle congruence are not explicitly included. It may be assumed that this content is addressed through supplementary instructional materials or other curriculum resources.

The Italian textbook series published by Atlas presents the four major triangle congruence statements in Book 1 (Vacca et al., 2017, p. 224). The SAS, ASA, and SSS conditions are described as criteria that can be mathematically justified. However, complete proofs are not provided in the textbook; instead, students are encouraged to construct the proofs themselves.

In the German textbook series, statements about triangle congruence are discussed in Chapter V4 of Book 7 (*Mathematik für Gymnasien 7–10*). Four conditions are presented: SAS, ASA, SSS, and even the ambiguous case of SSA. These statements are introduced without formal proofs. The textbook briefly discusses the surprising validity of the SSA case under specific conditions. A more detailed proof of a related case, based on simpler assumptions, was presented by Mironychev (2015). The comparative analysis of Geometry textbooks reveals several common trends in contemporary secondary-school Geometry education. First, the examined textbooks contain relatively few formal proofs of fundamental geometric properties. This pattern is observed not only in the treatment of triangle congruence but also in the presentation of theorems related to parallel lines, parallelograms, and other geometric relationships. In addition, mathematical statements are sometimes presented without clearly identifying whether they represent postulates, theorems, or consequences of previously established results. Similar tendencies are observed in the treatment of algebraic and geometric formulas, including relationships involving triangle segments, angle properties of polygons and circles, and area formulas.

A notable tension emerges between school mathematics and advanced mathematical practice. While formal proof receives limited attention in many secondary-school courses in Geometry, Algebra, and Calculus, proof remains a central component of university mathematics and mathematical research. At the school level, formal proofs are often supplemented by exploratory activities, examples, and applications designed to help students develop confidence in the validity of mathematical statements (Miyakawa & Herbst, 2007). The present study argues for maintaining an appropriate balance between exploration and rigorous mathematical justification in secondary mathematics education.

Proof of the Pythagorean Theorem

The Pythagorean Theorem is a traditional and fundamental component of secondary-school Geometry curricula. Throughout the history of mathematics, numerous proofs of this theorem have been developed, and the related literature is extensive (Gerwig, 2026). The two primary approaches to proving the theorem are based on the concepts of area and similarity.

The theorem can be represented geometrically as a relationship among the areas of squares constructed on the sides of a right triangle. Alternatively, it can be expressed algebraically through the relationship among the squares of the side lengths. These different perspectives are presented and emphasized in various ways across the textbooks analyzed in this study. Table 3 provides a brief summary of how the Pythagorean Theorem is introduced and justified in the selected textbooks.

Table 3
The Pythagorean Theorem Presented in Different Textbooks

Statement	**USA**: McDougal Littell	**France**: Hatier	**Italy**: Atlas	**Germany**: Klett Verlag
Area	There is the explanation of the concept, p.49.	Discussion about the length of sides in 4, 159	Definition with extensive explanations and numerous examples in 2, p.102	Discussion in 8, p.190
Pythagorean Theorem	–Proof with area, p. 434 –Proof with the similarity, p.455	Demonstrations and exercises in 4, p. 159–162	Detailed explanation and proof of the theorem in 2, p.194	Discussion of the theorem in 9, p.161

The American textbook published by McDougal Littell presents two approaches to proving the Pythagorean Theorem. The first proof is based on the concept of area (Larson et al., 2017, p. 434), although a formal discussion of area appears later in the textbook (Larson et al., 2017, p. 720). The authors rely on students' prior knowledge of area concepts developed in middle school. The second proof of the theorem is based on the concept of similarity and similar right triangles (Larson et al., 2017, p. 455). Thus, students have the opportunity to explore different approaches for establishing this fundamental result.

In the French Hatier textbook, the primary emphasis of the Pythagorean Theorem is placed on the relationship between the length of the hypotenuse and the lengths of the two legs of a right triangle (*Triangle 4*, p. 162). Several examples involving different types of triangles demonstrate how the theorem can be applied to determine unknown side lengths in right triangles. However, an explicit proof is not provided and is left as a possible activity for students. The chapter devoted to the Pythagorean Theorem does not discuss the relationship between the areas of squares constructed on the sides of a right triangle.

In the Italian Atlas textbook, the Pythagorean Theorem is introduced through the concept of area (*Geometria 2*, p. 193). Area is defined as a measurable quantity (*misura della sua superficie*), and units of area are discussed before introducing the theorem. The theorem is presented with an explicit proof, and its algebraic form is also provided. The textbook also describes numerous applications of the theorem to polygons and other geometric figures.

The German Geometry textbooks published by Klett Verlag present the Pythagorean Theorem as a property (*der Satz*) without an explicit proof (*Mathematik für Gymnasien 9*, p. 161). The emphasis is placed on the meaning of the theorem, its applications, and its converse statement.

Overall, the primary focus of the contemporary textbooks analyzed in this study is on the application of geometric statements rather than on their formal justification. In the case of triangle congruence, students are often encouraged to recognize, memorize, and apply congruence criteria through diagrams and carefully structured exercises. A similar emphasis on application rather than proof can be observed in many online educational resources, which frequently support procedural problem solving rather than the development of deductive reasoning.

Findings and Discussion

The analysis of the selected textbooks allows several preliminary generalizations regarding current educational materials used for teaching Mathematics and Geometry.

First, in some countries, particularly France and Germany, the Geometry course is integrated into a broader mathematics curriculum rather than taught as a separate subject. Within this structure, students encounter geometric concepts in smaller instructional units distributed throughout the school year. Such an organization may provide limited opportunities for developing formal mathematical reasoning and proving fundamental statements, including triangle congruence criteria, the Pythagorean Theorem, conditions for parallel lines, and formulas for areas and volumes of geometric solids.

Second, contemporary classroom practices often place less emphasis on direct and explicit proofs of fundamental theorems and instead incorporate demonstrations, exploration, and activities designed to verify the validity of mathematical statements. These approaches are frequently combined with small-group discussions, collaborative projects, and student presentations. Such strategies create more opportunities for active student participation, increase students' confidence, and support engagement in the learning process. However, a significant concern is that this approach may reduce the level of mathematical rigor, the depth of understanding, and decrease the college readiness if formal justification is not sufficiently emphasized.

The limited number of formal proofs presented in the analyzed textbooks are often simple consequences of previously established postulates or definitions. For example, the AAS theorem in the McDougal Littell textbook is derived from previously introduced congruence conditions (Larson et al., 2017, p. 250), while some geometric properties in the Hatier textbook are consequences of definitions (Hatier, 2012, Vol. 4, p. 147). As a result, some textbooks may appear primarily as collections of established facts accompanied by procedures and examples demonstrating how these facts can be applied to solve problems. As Miyakawa (2012) noted, many textbook proofs are presented as examples or solutions to exercises rather than as central components of mathematical learning. Consequently, students may experience difficulties constructing proofs independently without teacher guidance or additional support.

This study argues that formal proofs should remain an essential component of contemporary Geometry courses; however, they should be introduced through pedagogically effective and student-centered approaches. A possible instructional model combines short teacher-led demonstrations, structured student activities, and collaborative learning. The instructional

sequence may begin with a brief teacher presentation of a proof, either through a short explanation or a guided classroom discussion. Such demonstrations should be limited in length to maintain students' cognitive engagement. During this stage, students can take notes, ask questions, and predict subsequent steps in the argument. To support active learning, students may also use proof templates that provide the structure of an argument while allowing space for completing reasoning and justification.

At present, most textbooks have both student editions and teacher editions. Teacher editions typically include answers to exercises, lesson plans, expanded instructional objectives, and classroom activity suggestions. However, these resources often do not provide complete proofs of fundamental theorems, properties, and formulas. A teacher resource containing a systematic collection of mathematical proofs could provide valuable support for preparing well-qualified mathematics teachers and future generations of educators.

Third, the analysis indicates that some textbooks are not always structured according to the logical organization of mathematics. In particular, they do not consistently distinguish among undefined terms, definitions, postulates, and theorems. For example, discussions of triangle congruence may appear without an explicit definition of congruence (Lambacher & Schweizer, 2020, p. 180), and discussions of parallel lines or rhombuses may present properties without clearly introducing the underlying definitions (Hatier, 2012, Vol. 4, p. 145).

In addition, textbooks frequently use related terms such as "property," "statement," and "conjecture" without clearly explaining the distinctions among these concepts. The presentation often assumes that students already understand the mathematical meaning and relationship of these terms.

Fourth, the limited role of proofs in Geometry courses and the limited derivation of formulas in Algebra appear to be connected to broader curriculum priorities emphasizing applications and real-world problem solving. For example, learning objectives in some Grade 10 mathematics textbooks emphasize applications through statements such as "students will describe," "students will demonstrate," and "students will formulate," while providing less emphasis on constructing proofs of theorems or deriving formulas (Larson et al., 2017, p. TX4).

These preliminary findings and trends provide a basis for developing recommendations for improving current and future mathematics educational materials.

Conclusions and Recommendations

The review of selected Geometry textbooks, together with the authors' teaching experience, indicates that in recent years the role of theorem proofs and the derivation of algebraic formulas has become less central in secondary mathematics education. The emphasis has increasingly shifted toward activities and applications designed to help students verify the validity of mathematical statements and apply established properties to solve problems. However, it is important to recognize that proofs of fundamental geometric properties and derivations of mathematical formulas play a role in education that is equally important to their applications.

A curriculum based primarily on mathematical facts and procedures without sufficient attention to formal justification may limit students' opportunities to develop deeper mathematical understanding, particularly in Geometry and Algebra at the high school level. In addition,

limited exposure to mathematical proof may create challenges in preparing future generations of mathematics educators who need a strong understanding of deductive reasoning.

Based on the findings of this comparative study, the following recommendations are proposed for educators, publishers, and textbook designers to improve secondary-school Geometry and Algebra textbooks.

1. Explanations in textbooks should be more mathematically structured. Fundamental mathematical elements, including undefined terms, definitions of mathematical objects, postulates, and theorems, should be explicitly identified and distinguished. The use of related terms such as "properties," "statements," and "conjectures" should be limited and clearly explained to readers.
2. Proofs of theorems concerning fundamental geometric properties should be included in the main body of textbooks. An alternative approach would be to provide comprehensive proofs in teacher editions to support instructors. Important algebraic formulas should also be derived and explained rather than presented only as computational tools. Textbooks and curricula should include assignments and activities that engage students in constructing and explaining proofs of fundamental properties.
3. Learning objectives for Geometry and Algebra courses should include mathematical justification as an explicit goal. For example, objectives should state that students understand the proofs of important theorems and the derivations of major formulas and can explain the underlying reasoning.
4. Geometry should be considered as a separate subject within the high school mathematics curriculum, with sufficient instructional time to develop both conceptual understanding and formal reasoning.

The international comparison of mathematics textbooks should continue in future research. Further collaboration among educators, school administrators, publishers, and other professionals can help identify important topics for comparing educational materials and support the development of more effective resources for students. Such efforts may contribute to improving students' college readiness and preparing future generations of qualified mathematics educators.

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

The authors declares that ChatGPT, an AI-generative software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from ChatGPT, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Chapiron, G., et al. (2012). *Mathématiques* (Vols. 3–5) *Triangle* [*Mathematics* (Vols. 3–5): *Triangle*]. Hatier.

Clivas, S., & Miyakawa, T. (2020). The effect of culture on mathematics lessons: An international comparative study of a collaboratively designed lesson. *Educational Studies in Mathematics, 105*, 53–70. https://doi.org/10.1007/s10649-020-09980-1

Euclid. (2016). *The Elements*, *Vol.1*. Dover Publications.

Fujita, T., & Jones, K. (2014). Reasoning-and-proving in geometry in school mathematics textbooks in Japan. *International Journal of Educational Research*, *64*, 81–91. https://doi.org/10.1016/j.ijer.2013.09.014

Gerwig, M. (2026). *The Pythagorean theorem in 365 proofs*. Springer.

Graven, M., Venkat, H., Essien, A., & Vale, P. (Eds.). (2019). *Proceedings of the 43rd Conference of the International Group for the Psychology of Mathematics Education* (Vol. 1). International Group for the Psychology of Mathematics Education.

Knuth, E. J. (2002). Teachers' conceptions of proof in the context of secondary school mathematics. *Journal of Mathematics Teacher Education, 5*, 61–88.

Lambacher, T., & Schweizer, W. (2020). *Mathematik für Gymnasien* [*Mathematics for Grammar Schools*]. Ernst Klett Verlag.

Larson, R., et al. (2017). *Geometry*. McDougal Littell.

Lo, J., et al. (2021). The introduction and development of triangle congruency in Chinese and U.S. textbooks. In D. Olanoff, K. Johnson, & S. Spitzer (Eds.), *Proceedings of the 43rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 73–77). North American Chapter of the International Group for the Psychology of Mathematics Education.

Mironychev, A. (2015). Congruency theorems in the geometry curriculum of high schools: An international comparison. *Universality of Global Education Issues, 2*. https://ugei-ojs-shsu.tdl.org/ugei/index.php/ugei/article/view/12

Miyakawa, T. (2012). Proof in geometry: A comparative analysis of French and Japanese textbooks. In *Proceedings of the 36th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 3, pp. 225–232). International Group for the Psychology of Mathematics Education.

Miyakawa, T., & Herbst, P. (2007). Geometry teachers' perspectives on convincing and proving when installing a theorem in class. In *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 3, pp. 366–373). International Group for the Psychology of Mathematics Education.

Prytz, J. (2007). *Speaking of geometry* (Uppsala Dissertations in Mathematics, No. 49). Uppsala University.

Seymour, F. Eugene (1925). *Plane Geometry: A Traditional Approach*. Pensacola, FL: A Beka Book, 1925.

Vacca, R., et al. (2017). *Tutti matematici: Geometria* (Vols. 1–3) [*Everyone Is a Mathematician: Geometry* (Vols. 1–3)]. Istituto Italiano Edizioni Atlas.

Wiworo. (2021). Teachers' competencies in doing direct proof in geometry. In *Proceedings of the 2nd National Conference on Mathematics Education 2021 (NaCoME 2021)* Advances in Social Science, Education and Humanities Research, Vol. 656, pp. 238–242). Atlantis Press. https://doi.org/10.2991/assehr.k.220403.034

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The Relationship Between Indonesian Children's English Vocabulary Size and Academic Success at School in Leeds, UK

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Abstract

Having a high vocabulary size is crucial for young L2 learners who study at L1 schools. As a result of the high number of international students in the United Kingdom, many young Indonesian learners studying in L1 schools face challenges in acquiring a second language and academic achievement. Previous studies on vocabulary size and academic achievement often focused on L1 speakers and EFL in home countries, but few studies discussed the topic of Indonesians studying in English-speaking countries. This study investigated the relationship between vocabulary size and academic achievement of Indonesian primary students, aged from 7 to 9, living in Leeds, UK. A mixed-method was implemented using a picture vocabulary test adapted from the Peabody Picture Vocabulary Test (PPVT) to measure ten participants' vocabulary size and six interviews with parents to explore participants' current academic achievement. The finding showed that, while seven participants reached the 1000-word level, there were only two students who had obtained the 2000-word level, and no participants had passed the 3000-word level. By using thematic analysis, interview data showed a strong relationship between vocabulary size and academic success. Although low vocabulary size might have had little influence on some participants' academic performance, it still affected students' engagement and class participation. This study contributed to supporting multilingual learners studying in an L1 school.

Keywords: vocabulary size, academic achievement, vocabulary test

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Introduction

The past decade has witnessed a growing number of Indonesian university students living in the United Kingdom. While the Indonesian student association in the United Kingdom noted 1,212 Indonesian students in 2021 (PPIUK, 2021), the number of Indonesian students in the United Kingdom increased from 3,095 in 2018/19 to 4,230 in 2022/23 (GSLGLOBAL, 2025). In Leeds, there are more than 413 students enrolled in universities around Leeds. Most of them are undergraduate and master's students who study at different universities across Leeds. Although the number of doctoral students is not as many as others, married individuals often bring their families, contributing to the number of Indonesians in the UK. The growing number of Indonesian families creates a unique experience for Indonesian children as they experience a transition from studying in their home country to an English-speaking country. After arriving in the UK, Indonesian children often begin going to primary school in years 1 to 4.

As many Indonesian parents commented, a concern has been expressed about their children forgetting their mother tongue, so they encourage their children to speak Bahasa Indonesia at home. These Indonesian children are speaking two languages while living in the UK: speaking Bahasa Indonesia at home with their Indonesian parents and speaking English with their teachers and peers at school. Additionally, another concern has arisen that because Indonesian students are more accustomed to teacher-centred learning, they often face language barriers that make them struggle to keep up with their peers in academic performance at school, as UK schools tend to emphasize interactive and student-centred approaches. Thus, it makes these children struggle to adapt to the new school environment. The challenges highlight the importance of providing children with linguistic resources, specifically vocabulary knowledge, to bridge the gap between children's language level and linguistic demands required across school subjects.

The more words L2 learners can acquire, the more chances they have, including children, to use the language effectively. It makes vocabulary size become a crucial component in learning a second language for students. By acquiring a high vocabulary size, students may be able to understand text, follow instructions, and engage in academic discourse better than those who have a lower vocabulary size. Thus, vocabulary size can be a measurable indicator of language proficiency, which then justifies students' academic success at school.

For these reasons, I am interested in conducting research to find out Indonesian vocabulary size, which later defines the relationship between their vocabulary size and their academic performance. Such information provides insights for parents and teachers about the current vocabulary size of Indonesian children living in Leeds and future directions in children's language development. As it is also linked to academic achievement, I am motivated to contribute knowledge to identify gaps and strengths that help to build better language support and instruction and improve academic outcomes. To form research questions in this study, a literature review will be provided in the subsequent chapter.

Literature Review

What Is Vocabulary Size?

Vocabulary size plays a crucial role in students' language learning. Vocabulary size, or knowledge, refers to the number of words that are known, and "knowledge" refers to how well students know the words Qian (2002). The knowledge of a word not only presents a definition

but also defines how that word fits into the context (Stahl, 2005), which is an essential skill to ensure the effectiveness of communication (Nguyen & Nation, 2011).

L1 vocabulary development refers to learners' ongoing process of acquiring and understanding the depth of words and their meaning, which supports learners' comprehension across all language areas (Rasinski & Rupley, 2019). Through different types of assessment, many studies defined learners' vocabulary size, measured in word family, based on their age. A word family can be defined as a base word and its related forms of inflections and derivations, such as "act," "acting," "actor," and "acted" (Hestetræet, 2018). Hart and Risley (1999), who studied children aged 19 to 36 months, found that word growth within children under three years old is still under the influence of parental involvement. Around age 4.5 to 5, children can comprehend verbally based word meanings (Biemiller, 2024). According to Nation and Waring (1997), native speakers will add roughly 1,000-word families per year to their vocabulary size. That means that a five-year-old learner will have around 4,000 to 5,000-word families. After age 5, children typically experience rapid growth in both receptive and productive vocabulary, as Biemiller and Slonim (2001) calculated children's vocabulary size at ages 6 to 11 years old (grades 1–5) ranges from 2,669 to 8,411-word families, while Anglin (1993) estimated the range from 3,092 to 7,532-word families. Moving on to junior high students, around 9,684-word families are acquired (Zechmeister et al., 1995). However, it is important to remember that vocabulary growth is not solely influenced by age but often correlated strongly with cognitive development and reading comprehension (Anglin, 1993).

For L2, vocabulary development is needed, as it is a crucial component in language learning. According to Miralpeix (2019), L1 and L2 share a similarity in vocabulary acquisition in that both L1 children and L2 learners face a big challenge to learn many target words. Unlike L1, incidental learning does not often occur within L2 learners due to the different amount of language exposure L2 learners get, which Rasinski and Rupley (2019) claim can hinder L2 learners from reading comprehension in the target language. While L1 children can learn up to 500 words annually in their school years, L2 learners need five to six years to acquire around 3,000-word families (Nagy et al., 1985). For L2 primary students, various studies were conducted in different countries to estimate primary students' vocabulary size. Catalán et al. (2006) calculated 130 Spanish Grade 6 students' receptive vocabulary size through Vocabulary Level Test in two different school setting (English as a subject and English used as communication tool), which revealed estimates of less than 1,000 words. Another study by Orosz (2009) estimated only 500 words within Hungarian Grade 3 students through a checklist test. In that test, students were provided with 120 words and asked to tell whether they know the meaning of the word or not. However, it is fair to remember that L2 students start learning the target language at different speeds, and other factors such as input, country, or gender may influence the vocabulary size test results. Thus, for L2 learners, it is highly suggested to have a high frequency of repeated exposure, learning strategies, and adequate studying time to master the target language (Moody et al., 2018).

The Relationship Between Vocabulary Size and Learners' Performance at School

Understanding about vocabulary size demands for achieving academic success may vary among researchers. The first 1000-word families cover the largest proportion of English, which allows English practitioners to estimate common vocabulary knowledge that impacts learners' ability to communicate in English (Webb et al., 2017). Several studies had shown that having a greater proportion of English vocabulary may improve students' ability in reading comprehension and academic spoken English. By mastering the first 1000 words in English,

students may have coverage of 83.25% when reading children literature and 91.06% coverage when reading graded books (Webb & Macalister, 2013); both types of coverage could go even further to 90% and 96.73% at the 2000-word level. Text coverage of 64.74%–88% on a standardized English proficiency test might be possible for students at the 1000-word level (Webb & Paribakht, 2015). In terms of academic spoken English, students may have coverage of 87.54% in 1000-word level (Dang & Webb, 2014). At 3000 high-frequency English vocabulary words, children may understand spoken English with 95% coverage (Hestetræet, 2018). Although the studies above do not mention other factors influencing students' ability in communication, all figures represent a statement that mastering word knowledge increases the chance to be proficient in English comprehension at certain levels. All figures mentioned above may set a standard for learners to acquire English words for building effective communication, both for native and non-native speakers, in L1 school setting. Without vocabulary knowledge, language production and language comprehension are impossible to achieve (Milton & Treffers-Daller, 2013). It implies that when children show difficulties in achieving academic success, there is a possibility for learners to have a smaller vocabulary size compared to age-matched peers.

Giving the context to Indonesian learners, most studies are focusing on older L2 students' vocabulary size, which indicates that studies focusing on young L2 learners are still rare. A study of Indonesian university students' vocabulary size using a vocabulary level test (Novianti, 2016) showed the result that many students had a size lower than 2000 words although they received extra hours of English instruction. Mustafa (2019) also investigated high school graduates' vocabulary size, which showed the result of 72% of 1000 words, 54% of 2000, and 49% of 3000 words. These figures suggest that it did not satisfy the curriculum standards in Indonesia. However, despite the extensive research on older Indonesian students, there is a lack of empirical data on Indonesian primary students studying in an English-speaking country. This present study addresses the gap by focusing on two research questions: 1) What is vocabulary size of Indonesian L2 primary students in Leeds? 2) What is the relationship between vocabulary size and Indonesian children's performance at school? Details about the methodology and how they answered the research questions will be explained in the next chapter.

Methodology

Coming from my research questions, which determined different types of data, my research approach used mixed methods. Mixed methods refer to a combination of quantitative and qualitative approaches to explore the depth of the issue and give more comprehensive answers (Paltridge & Phakiti, 2015). A quantitative approach using receptive vocabulary assessment justified a student's receptive vocabulary size, while for the qualitative approach, interviews with parents were conducted to understand learners' vocabulary learning strategies before coming to the UK and children's performance at school.

Sampling and Participants

Purposive sampling was used for both methods, which selected participants based on judgment and perspective that best facilitate insight into the research (Emmel, 2013). 10 Indonesian children (2 boys, 8 girls, N = 4: 7 years old, N = 4: 8 years old, N = 2: 9 years old) who are currently living in Leeds, UK, were recruited with their parents' consent. Participants were selected based on their background, e.g., having moved from Indonesia and enrolled in different primary schools in the UK. All participants have been living in Leeds for different

periods, ranging from 2 to 48 months. As academic performance is an important component in this study, I excluded those who are home-schooled and paid more attention to those who study in local primary schools in Leeds. For the qualitative data, 6 parents of the identified children were interviewed, and they were recruited through consent forms sent to them.

Data Generation

The students' receptive vocabulary size test took place around June and July 2025 in Leeds, UK. The vocabulary picture test required children to pick one out of twelve (12) pictures that best represents the word the examiner said. There were twelve sets, which made a total of 144 words taken from PPVT word lists. Following the nature of PPVT word lists, test takers started the set based on age, meaning each age group had a different start item. Each participant should complete all 12 words in each set that were intended to become increasingly difficult without being timed, and the basal set rule was one (1) or zero (0) errors in a set. Before having the real test, participants must have a trial test to check their understanding of the rules. All students' responses were recorded in the response and errors form.

The administered words were then profiled using the VocabProfilers Frequency Frameworks (Laufer et al., 2025) to categorize the words into 1000–16000-word frequency levels. The participants started the set containing mostly K1 and K2 words, and the level would increasingly be difficult in each set. However, although naturally PPVT set lists contain high-frequency words in the beginning, there was at least one higher-level word, such as K6 or K7, in earlier sets, which would limit the students from getting higher marks because the ceiling set rule was eight (8) or more consecutive errors in the original test. It then might underestimate their vocabulary sizes. Therefore, in the modified picture test, a revised ceiling rule of 8 errors in total across all items was proposed to create space in observing students' error patterns. Once the children achieved eight errors or more in total, the test would stop. Table 2 below shows the details of how many administered profiled words in each level.

Following this, semi-structured interviews with parents were conducted after the quantitative data had been collected to "investigate such constructs as experiences, identities, attitudes, and beliefs" (Rose et al., 2020, p. 114). Because these Indonesian children are studying in different schools, conducting interviews with parents was more efficient, which suited to find out children's experience before coming to the UK and their academic performance at school. The interviews were all conducted in person, and I used a voice recorder to record their answers.

Data Analysis

To answer the first research question (RQ1), each student's answer was checked to find the correct answer, which would be presented as a raw score. It was then sorted by its frequency level from the 1000, 2000, and 3000, as these levels are the most frequent words in English. The data then were converted into percentages to represent each student's receptive vocabulary size. A strong reason why word frequency levels were used was that it could be a baseline for interpreting the scores.

When considering the threshold, 12 out of 18 correct answers, or about 66%, indicates a need for additional lessons in learning vocabulary (Nation, 1983), and 80% correct answers of administered words was recommended by Schmitt to be the standard (Xing & Fulcher, 2007). However, following Guttman scalability analysis, 26 out of 30 correct answers, around 87%, are needed to acquire each level (Schmitt et al., 2001). Thus, an 87% threshold was proposed

to reflect students' vocabulary size. When the student achieved 87% of the words given, they had acquired the level in language learning. For instance, children who passed the standard of 87% in 3000 high-frequency English vocabulary words understand spoken English with 95% coverage (Hestetræet, 2018).

Qualitative analysis works with text and meaning (Creswell & Creswell, 2022). In my research, qualitative data were collected through interviews with parents. My direction derived from description to deeper analysis and interpretation. In the description, I tried to define what the participants do/think/say and how they feel/behave by setting up an interview process and transcribing data from the interview using Word Cloud Microsoft 365. Manual transcription was also conducted to ensure the accuracy of participants' responses. This analysis examined the entirety of the data collected to identify things and moments of interest and categorize it into code and theme. This analysis would find the answer for the second research questions.

Findings and Discussions

Indonesian Students' Vocabulary Size

The first set of questions (RQ1) aims to estimate the vocabulary size of Indonesian children living in Leeds. A modified picture vocabulary test was conducted which required participants to choose a picture represent what examiner says. The participants included ten children aged between 7 and 9 years old. After collecting and analysing the data, Indonesian receptive vocabulary test scores ranged from 25 to 96, which represents a quite diverse score. 7 out of 10 children had obtained a minimum of 87% or more in the 1000-word frequency level. 2 out of 4 7-year-old children acquired percentages below the threshold, although the average proportion reached a satisfactory level (M = 80.25%). As for 8-year-old children, only one participant did not achieve the threshold (N = 4, M = 93.75). The average proportion for 9-year-old participants (N = 2) was 94.5%, which showed both achieving the threshold. Moving on to the higher word level, the 2000-word level, it was found that only 2 out of 10 participants had acquired the minimum of 87%, that is, one from each of 8- and 9-year-old groups (M = 82.75% and M = 81.5). None of the participants from the youngest group had achieved the minimum (N = 4, M = 59.5%). Finally, no children had passed the threshold of 87% in the 3000-word level. Compared to older children, 7-year-old students showed the lowest average of 22.25%, while the rest of the age groups showed the average of 50% and 53%. Surprisingly, those who had not achieved in the first 1000 words were students who had been living in the UK for no more than two years.

Compared to L1 speakers, the estimates from the present study were far below the estimated vocabulary size of the native speakers in the same age level. For L1 7-year-old speakers, the estimate of 5,175-word families was stated to be the minimum (Biemiller & Slonim, 2001), while 8- and 9-year-old L1 speakers acquire 4,582- (Anglin, 1993) and 6,794-word families (Biemiller & Slonim, 2001). The estimates showed that the participants still have a long way to reach the same level of estimates as L1 speakers, as there were only two students who passed the 2000-word frequency level.

Furthermore, compared to the thresholds of reading and speaking comprehension discussed in the literature, these students' vocabulary size estimates showed that while seven participants might understand basic academic spoken English with text coverage of 87.54% (Dang & Webb, 2014), text comprehension, such as children literature and graded reading with text coverage of 83.25% and 91.06% (Webb & Macalister, 2013), and 64.74%–88% of text coverage in

standardized English test (Webb & Paribakht, 2015), only two students might be able to comprehend more complex academic text comprehension with text coverage of 90% and 96.73% (Webb & Macalister, 2013). Lastly, since no participant could pass the threshold in the 3000-word level, it suggested that all participants were not at the level required for full classroom participation.

The Relationship Between Vocabulary Size and Indonesian Children's Academic Success at School

The last research question outlined a strong relationship between children's vocabulary size and their academic performance at primary school. From six interviews, four interviewees confirmed the first hypothesis that high vocabulary knowledge has a huge impact on children's social participation with teachers and peers, which had emerged as the first theme. However, in the second theme, two interviewees have commented that the vocabulary knowledge had no significant impact on their children's academic scores.

Most informants gave information that the improvement of their children's English vocabulary had a huge impact on students' engagement and social participation at school with their teachers and peers, which emerged as the first theme. Children who had a high vocabulary size on the test were more likely to be active in class activities, such as raising their hands to answer or asking questions, and to enjoy specific subjects, e.g., science. More than half of participants were recognized as active in collaborating with peers in both academics and sports, and several children received recognition like notice cards, certificates, or awards for being a good friend or communicator from the teachers.

On the other hand, for the second theme, one interviewee commented on how this vocabulary size does not affect their children's performance at school. Although it helps children to connect with their teachers and peers, their academic scores were not significantly improved, as the subject materials are considered advanced. Children may need to learn more beyond their general vocabulary knowledge to catch up with school subjects. The ones who commented on this matter were the parents who's the child having estimates under the threshold in all word frequency levels.

The "school academic performance" data justified the vocabulary size result. Participants who were considered passing the threshold in the assessment have high social performance at school, while those who were not achieving the minimum of 87% were informed to have developing progress at their school. As the findings showed that four out of seven participants (P2, P3, P6, P10) who had passed the 1000-word frequency level achieved participation awards, the vocabulary knowledge obtained by Indonesian children may positively affect their engagement with teachers and friends. These children might have acquired important communication skills, as in the 1000-word frequency level, these children have coverage of 87.54% in spoken language (Dang & Webb, 2014). By having an adequate vocabulary size, they are confident in speaking English and able to make connections with others (Uchihara and Harada, 2018). This was also encouraged by the rich exposure these students obtained inside and outside the classroom, giving them more opportunities in practicing their target language. Thus, prior vocabulary knowledge encourages students to be more confident and enhances their willingness to participate in classroom activities.

Overall, it can be concluded that the result of the analysis emphasizes the relationship between vocabulary size and students' academic achievement at school. Specifically, it correlates with

students' contribution to class activities by building positive relations with teachers and peers and affects their scores in non-English subjects. However, a few participants experienced no effect of having a high vocabulary size on their academic performance due to a lack of academic word knowledge. Thus, developing teacher skills in teaching and raising awareness of academic word use in primary school are necessary to support L2 primary students in understanding school subjects (Schuth et al., 2017). The next chapter will present the conclusion of this study.

Conclusion

This study aims to investigate the relationship between Indonesian primary students' vocabulary size and their academic performance at school in Leeds, UK. In answering the first research question (RQ1), the study revealed that with the threshold of 87%, 70% of all participants (N = 10) had passed the threshold in the 1000-word level, and there were only 20% of students who had obtained the minimum in the 2000-word level. Unfortunately, no participants had passed the minimum in the 3000-word level. The vocabulary size of Indonesian students showed that although these participants have been living in the UK, their vocabulary size is still far below that of native English speaker of the same age.

The discussion also answered the second research questions. This study suggested a strong relationship between the vocabulary size of Indonesian primary students in Leeds and their academic performance. The results show that vocabulary size might affect both participants' academic performance and social engagement. However, some parents commented that having a high vocabulary size had no effect on their children's performances at school. The discussion also suggests that in children's language learning, parents and teachers should focus not only on the language instruction but also on adequate language exposure and opportunities for interaction.

This present study has direct implication for language learning strategy, teacher training, and language support for multicultural students living in an English-speaking country. As this study underscores the importance of language exposure for L2 learners, it could encourage UK schools to have a language support policy specifically for L2 primary students. Furthermore, developing teacher skills in teaching and raising awareness of academic and specialist word use in primary school are necessary to support L2 primary students in understanding school subjects (Schuth et al., 2017).

There are some limitations in this present study. First, as the Indonesian population in Leeds, UK, is increasing each year, more participants should be involved in the vocabulary assessment to ensure the validity and the reliability of the test result. The number of samples affects the test results, which also influences the conclusions of the study. Second, most studies about the relationship between students and academic performance were conducted quantitatively; however, in this present study, the access to know students' academic performance from school officially is limited, and it may take a long duration to collect the data. Third, BNC/COCA word lists should be used in the assessment to make the analysis easier. As the analysis was done based on the first 3000-word families, it would be more manageable if BNC/COCA word lists were used. In this present study, PPVT word lists were used because the test was about receptive vocabulary using pictures.

For further study, first, with a larger number of participants, further study should be conducted in estimating academic vocabulary size to find out a deeper relationship between vocabulary

size and academic achievement at school. Second, specific academic subjects at school should be specified, e.g., English, math, and social science, within a similar demographic. It would highlight differences in vocabulary demand in each subject using the AWL, or academic word list, in the assessment.

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

I acknowledge the use of Copilot (Microsoft, https://copilot.microsoft.com/) to generate initial ideas on my topic and to give simple explanations of concepts that later I engaged with in academic literature. I also acknowledge it to translate some phrases from Bahasa Indonesia to English for the transcription as well checking the grammar and punctuation.

References

Anglin, J. M. (1993). *Vocabulary development: A morphological analysis*. Society for Research in Child Development.

Biemiller, A. (2024). Word meaning types acquired before vs. after age 5: Implications for education. *Frontiers in Psychology*, *15*, Article 1280568. https://doi.org/10.3389/fpsyg.2024.1280568

Biemiller, A., & Slonim, N. (2001). Estimating root word vocabulary growth in normative and advantaged populations: Evidence for a common sequence of vocabulary acquisition. *Journal of Educational Psychology*, *93*(3), 498–520.

Catalán, R. M. J., de Zarobe, Y. R., & Iragui, J. C. (2006). Vocabulary profiles of English foreign language learners in English as a subject and as a vehicular language. *Current Research on CLIL*, *15*(3), 23–28.

Creswell, J. W., & Creswell, J. D. (2022). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE.

Dang, T. N. Y., & Webb, S. (2014). The lexical profile of academic spoken English. *English for Specific Purposes*, *33*, 66–76.

Emmel, N. (2013). *Sampling and choosing cases in qualitative research: A realist approach*. SAGE.

GSL Global. (2025). *Inbound insight: Indonesia*. https://gslglobal.com/2025/01/31/inbound-insight-indonesia/

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Paul H. Brookes.

Hart, B., & Risley, T. R. (1999). *The social world of children learning to talk*. Paul H. Brookes.

Hestetræet, T. I. (2018). Vocabulary teaching for young learners. In S. Garton & F. Copland (Eds.), *The Routledge handbook of teaching English to young learners* (pp. 220–233). Routledge.

Laufer, B., Nation, P., Davies, W., Gardner, D., Browne, C., Culligan, B., Lonsdale, D., et al. (2025). *VocabProfiler*. https://www.lextutor.ca/vp/comp/

Milton, J., & Treffers-Daller, J. (2013). Vocabulary size revisited: The link between vocabulary size and academic achievement. *Applied Linguistics Review*, *4*(1), 151–172.

Miralpeix, I. (2019). L1 and L2 vocabulary size and growth. In S. Webb (Ed.), *The Routledge handbook of vocabulary studies* (pp. 189–206). Routledge.

Moody, S., Hu, X., Kuo, L.-J., Jouhar, M., Xu, Z., & Lee, S. (2018). Vocabulary instruction: A critical analysis of theories, research, and practice. *Education Sciences, 8*(4), 180.

Mustafa, F. (2019). English vocabulary size of Indonesian high school graduates: Curriculum expectation and reality. *Indonesian Journal of English Language Teaching and Applied Linguistics*, *3*(2), 357–371.

Nagy, W. E., Herman, P. A., & Anderson, R. C. (1985). Learning words from context. *Reading Research Quarterly*, *20*(2), 233–253.

Nation, I. S. P. (1983). Testing and teaching vocabulary. *Guidelines*, *5*(1), 12–25.

Nation, P., & Waring, R. (1997). Vocabulary size, text coverage and word lists. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 6–19). Cambridge University Press.

Nguyen, L. T. C., & Nation, P. (2011). A bilingual vocabulary size test of English for Vietnamese learners. *RELC Journal*, *42*(1), 86–99.

Novianti, R. R. (2016). A study of Indonesian university students' vocabulary mastery with vocabulary level test. *Global Journal of Foreign Language Teaching*, *6*(4), 187–195.

Orosz, A. (2009). The growth of young learners' English vocabulary size. In M. Nikolov (Ed.), *Early learning of modern foreign languages: Processes and outcomes* (pp. 181–194). Multilingual Matters.

Paltridge, B., & Phakiti, A. (2015). *Research methods in applied linguistics: A practical resource.* Bloomsbury Academic.

PPI UK. (2021). *Statistics of Indonesian students in the UK per February 2021.* https://ppiuk.org/2021/04/08/statistik-sensus-ppi-uk-november-2020-februari-2021/

Qian, D. D. (2002). Investigating the relationship between vocabulary knowledge and academic reading performance: An assessment perspective. *Language Learning, 52*(3), 513–536.

Rasinski, T., & Rupley, W. H. (2019). *Vocabulary development*. MDPI.

Rose, H., McKinley, J., & Baffoe-Djan, J. B. (2020). *Data collection research methods in applied linguistics*. Bloomsbury Academic.

Salim, H., & Hanif, M. (2021). English teaching reconstruction at Indonesian elementary schools: Students' point of view. *International Journal of Education and Practice, 9*(1), 49–62.

Schmitt, N., Schmitt, D., & Clapham, C. (2001). Developing and exploring the behaviour of two new versions of the Vocabulary Levels Test. *Language Testing*, *18*(1), 55–88.

Schuth, E., Köhne, J., & Weinert, S. (2017). The influence of academic vocabulary knowledge on school performance. *Learning and Instruction*, *49*, 157–165.

Stahl, S. A. (2005). Four problems with teaching word meanings. In E. H. Hiebert & M. L. Kamil (Eds.), *Teaching and learning vocabulary: Bringing research to practice* (pp. 95–114). Lawrence Erlbaum Associates.

Uchihara, T., & Harada, T. (2018). Roles of vocabulary knowledge for success in English-medium instruction: Self-perceptions and academic outcomes of Japanese undergraduates. *TESOL Quarterly*, *52*(3), 564–587.

Webb, S., & Macalister, J. (2013). Is text written for children useful for L2 extensive reading? *TESOL Quarterly*, *47*(2), 300–322.

Webb, S., & Paribakht, T. S. (2015). What is the relationship between the lexical profile of test items and performance on a standardized English proficiency test? *English for Specific Purposes*, *38*, 34–43.

Webb, S., Sasao, Y., & Ballance, O. (2017). The updated Vocabulary Levels Test: Developing and validating two new forms of the VLT. ITL – *International Journal of Applied Linguistics, 168*(1), 33–69.

Xing, P., & Fulcher, G. (2007). Reliability assessment for two versions of Vocabulary Levels Tests. *System*, *35*(2), 182–191.

Zechmeister, E. B., Chronis, A. M., Cull, W. L., D'Anna, C. A., & Healy, N. A. (1995). Growth of a functionally important lexicon. *Journal of Reading Behavior*, *27*(2), 201–212.

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What Learning Analytics Reveals About Adult Students in Online Higher Education

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Abstract

Online learning has become an established part of higher education, offering flexible study opportunities that are particularly relevant for adult learners combining studies with work and family responsibilities. At the same time, digital learning environments generate detailed data that can be used to better understand student behaviour. This study examines adult students' learning in an online higher education course by combining learning analytics with survey-based self-assessments. The dataset includes pre- and post-course surveys, video viewing data, learning platform activity logs, and course performance data from 23 students. The study explores how adult learners engage with course materials, how they assess their competence before and after the course, and how activity patterns relate to performance. The results show considerable variation in study behaviour, with activity concentrated around deadlines and weekends. Students initially assessed their competence critically, particularly in data analytics, but reported clear improvement by the end of the course. Initial self-assessments did not appear to clearly predict course success. The findings suggest that learning analytics can provide useful insights into adult learners' engagement and progression, but its interpretive value depends on course design, assessment practices, and the technical implementation of the learning environment.

Keywords: learning analytics, adult students, online higher education, online learning, student experience

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Introduction

Learning analytics (LA) refers to the collection, analysis, and use of data generated in learning environments to understand and support learning and improve teaching practices. In online higher education, learning analytics has become increasingly relevant because digital platforms make it possible to track a wide range of student activities, including video viewing, quiz completion, logins, task submissions and participation patterns.

Previous research has shown that learning analytics can help identify behaviours associated with course continuation and completion. For example, the number of videos watched has been linked to successful course completion (de Barba et al., 2016; Pursel et al., 2016), and rewatching videos has been associated with a lower likelihood of dropping out (Sinha et al., 2014). Quiz completion has also been found to be an important predictor of course completion, especially in the early and middle stages of a course (Ramesh et al., 2014), while high quiz scores may further increase the likelihood of finishing a course successfully (Jiang et al., 2014).

At the same time, online learning is shaped by more than measurable activity alone. Students' experiences of course structure, interaction, feedback, flexibility, and assessment all influence engagement and perceived learning. Earlier studies have shown that students value teachers' pedagogical competence, clear guidance, social presence, and transparent assessment practices in online learning environments (Mäkipää et al., 2022). Students have also reported that well-designed courses, strong motivation, confidence in using digital tools, and good self-regulation skills support successful online learning (Haarala-Muhonen et al., 2025; Masiello et al., 2024; Viberg et al., 2020).

For adult learners, these questions are particularly important. Adult students often combine studies with employment and other responsibilities, which may shape when and how they participate in online learning. Yet research focusing specifically on how learning analytics reflects the study practices and self-assessments of adult students in online higher education remains relatively limited.

This paper examines adult students' study practices in one online higher education course by combining survey-based self-assessments with system-generated learning analytics. The study focuses on three questions:

1. What does learning analytics reveal about adult students' study practices during an online course?
2. How do adult students assess their competence before and after the course?
3. How do students' activity patterns and self-assessments relate to course performance?

By addressing these questions, this study contributes to a more practice-oriented understanding of how learning analytics can support course design and interpretation in adult online higher education.

Background

Research on learning analytics has often focused on predicting course completion, identifying at-risk learners, and modelling activity patterns in digital learning environments. Log data has been a particularly common source of evidence, while recent reviews have also highlighted the growing role of dashboards, feedback processes, and more advanced analytic methods (Masiello et al., 2024; Palanci et al., 2024). At the same time, scholars have emphasized that

analytics alone cannot capture all relevant dimensions of learning. Motivation, metacognition, emotions, and self-regulated learning remain important but are often only partially visible in system data (Masiello et al., 2024).

In online higher education, video use has attracted considerable attention. Watching lecture recordings and instructional videos has repeatedly been associated with successful participation and course completion (de Barba et al., 2016; Haarala-Muhonen et al., 2025; Pursel et al., 2016). However, participation in online discussions has produced more mixed findings, with some studies linking forum activity to successful completion and others suggesting that it may also signal struggle or disengagement (Pursel et al., 2016; Ramesh et al., 2014). This underlines the importance of interpreting analytics data cautiously and in context.

From the student perspective, online learning is influenced not only by available materials but also by teaching practices and course design. Students have identified clear guidance, pedagogical quality, interaction, flexibility, and timely feedback as central conditions for successful online learning (Haarala-Muhonen et al., 2025; Kuluşaklı, 2025; Mäkipää et al., 2022). In addition, self-regulated learning skills such as planning, monitoring, and evaluating one's learning have been shown to support academic success in online environments (Masiello et al., 2024; Viberg et al., 2020).

For adult learners, flexibility may be particularly significant, as online study often takes place alongside work and family responsibilities. This makes it useful to examine not only performance outcomes but also patterns of timing, engagement, and self-assessed competence. In that sense, combining learning analytics with survey-based student perspectives can provide a richer understanding of adult students' study practices than either source alone.

Method

Research Context

The study examined one online higher education course, *The Practice of Knowledge Management* (3 ECTS), implemented between 7 January and 27 February 2026 in open higher education (Open University of Applied Sciences). The course content focused on the basics of data analytics, the use of Power BI, and the visual presentation of reports from a graphic design perspective. The course materials consisted mainly of written instructions produced by the teachers, lecture videos, links to online materials, and examples of visualizations created with Power BI.

Course completion was based on assignments and Moodle-based assessment tasks. In addition to tasks based on learning materials, students completed analysis of a public visualization and self-assessment related to a visualization they had produced themselves.

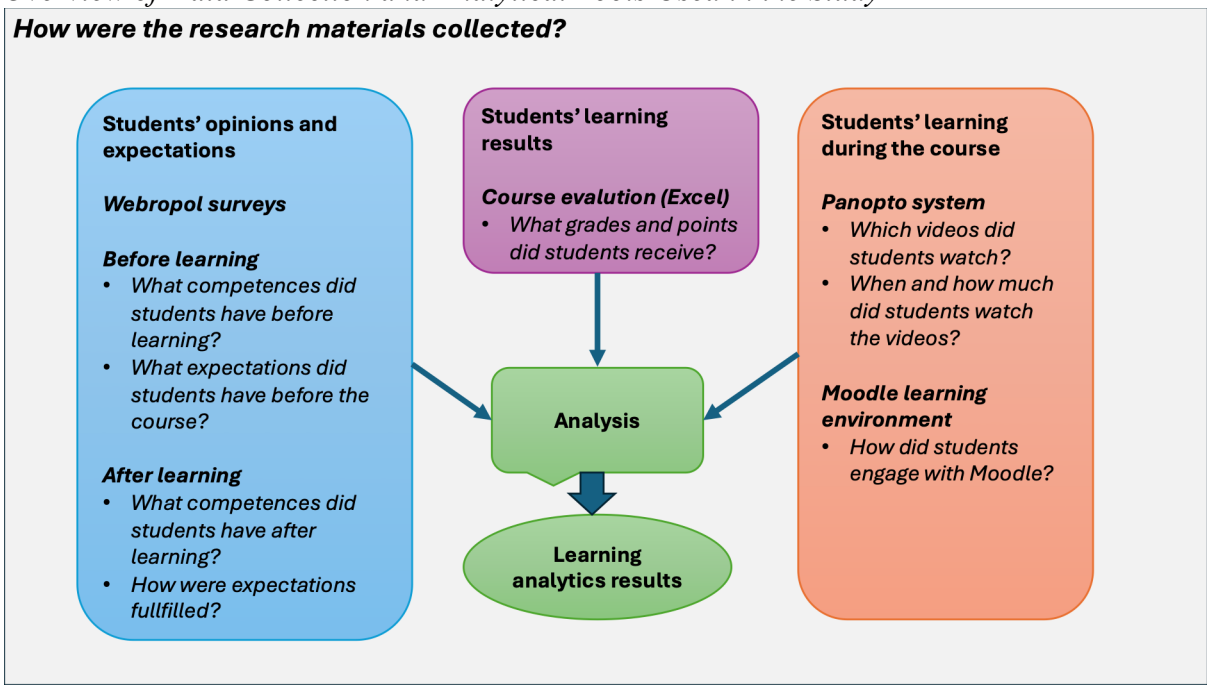
Data Sources

The study combined four sources of data:

1. a pre-course Webropol survey on students' self-assessed competence,
2. Panopto video-viewing data collected during the course,
3. Moodle activity log data and course performance data, and
4. a post-course Webropol survey on students' self-assessed competence.

The overall analytical idea is illustrated in **Figure 1**.

Figure 1
Overview of Data Collection and Analytical Tools Used in the Study



The pre-course survey was distributed several months before the course started. Thirty-one respondents answered this survey, but not all of them later participated in the course. The main course dataset consisted of the 23 students who completed course work and thus generated activity data in Moodle and Panopto as well as course points and grades. In addition, 30 students had logged in to the learning platform, while 23 of them watched the Power BI videos. As a result, different parts of the analysis are based on partially overlapping but not identical subsets of participants.

Variables and Analytical Approach

The study used a descriptive case-based design and can be characterized as a descriptive case study combining survey data and learning analytics. The purpose was not to build predictive statistical models but to examine what kinds of insights can be gained by combining self-assessment data with learning analytics in one adult online learning context.

The key variables were as follows:

- *self-assessed competence*, measured before and after the course on a scale from 0 to 5 in three broad content areas: knowledge management theory, the basics of data analytics, and analytics-related applications.
- *activity*, referring to actions recorded in Moodle logs.
- *video engagement*, referring to Panopto viewing time and number of views.
- *course performance*, measured through assignment points and final course grades.

The maximum number of assignment points in the course was 100. Final grades were given on a scale from 0 to 5. Because the surveys and the course participation data did not include exactly the same respondents, survey results are interpreted as indicative rather than strictly matched measures at the individual level.

The data were analysed descriptively, and the results were visualized using Power BI.

Results

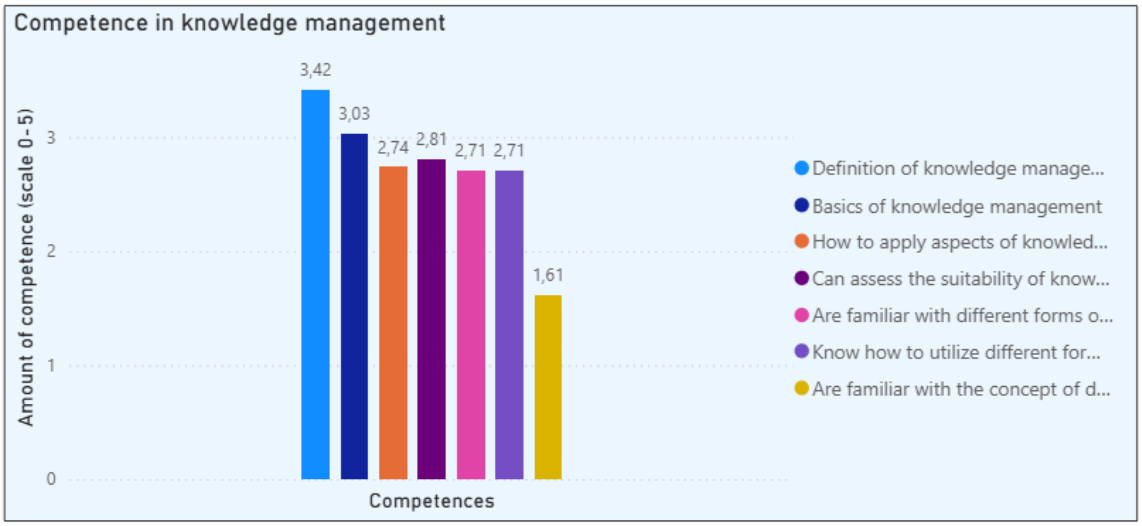
Students' Self-Assessed Competence Before the Course

Before the course, students were asked to assess their competence in three areas: knowledge management theory, the basics of data analytics, and analytics-related applications. Overall, students rated their starting competence relatively modestly. On average, self-assessed competence was 2.76 in knowledge management theory, 1.80 in the basics of data analytics, and 2.24 in analytics-related applications. Students also estimated that they would spend an average of 7.1 hours per week on the course.

The baseline results suggest that students felt more confident about knowledge management as a conceptual area than about data analytics. The lowest ratings were found in topics related to analytics concepts and tools, especially more advanced or less familiar applications. By contrast, commonly used tools such as Excel were rated more positively. Overall, the pattern indicates that students entered the course with uneven but generally cautious assessments of their competence.

A summary of the baseline self-assessments is presented in **Figure 2**.

Figure 2
Students' Self-Assessed Competence Before the Course Across the Three Main Content Areas



Student-level variation was considerable. Some students rated themselves consistently low across all three areas, while others reported more selective strengths. The baseline data therefore suggest not only low average confidence in analytics-related topics but also substantial heterogeneity among adult learners entering the course.

When initial self-assessments were compared with final course grades, students' starting perceptions of their own competence did not appear to correspond closely to later course success. Most students rated their initial competence rather low, yet this did not prevent successful course completion. This finding suggests that low initial confidence should not automatically be interpreted as low potential for success in adult online learning.

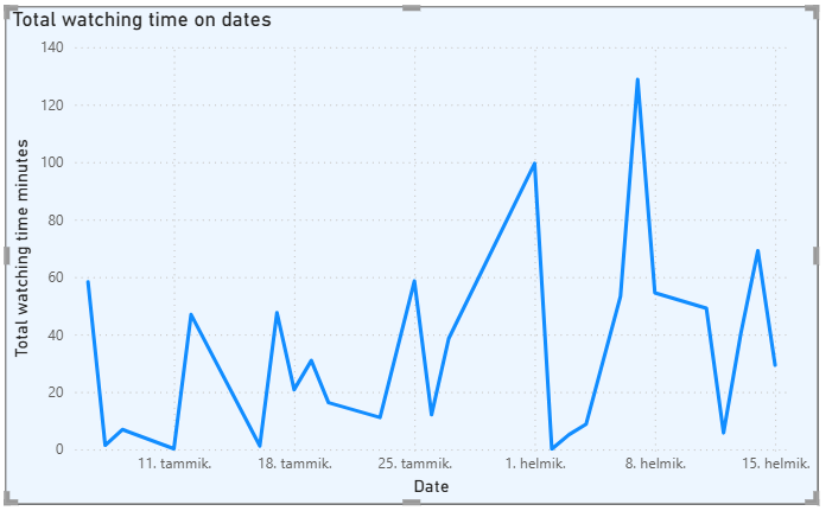
Learning Analytics During the Course

The course included five instructional videos related to the use of Power BI, with a total duration of 47.17 minutes. Across the course, students accumulated 895 minutes of viewing time and 131 viewing events. The average video length was 9.4 minutes, while the average viewing time per student was 38.9 minutes. On average, students generated 5.7 viewing events each, which is close to the number of available videos.

Video-viewing patterns varied substantially across students. Some students watched clearly more than the total duration of the provided video material, suggesting repeated viewing of selected videos, while others watched substantially less. A middle group viewed approximately the equivalent of the full video offering once. This pattern indicates that adult students used the videos in different ways: some appeared to revisit content repeatedly, while others seemed to use the videos more selectively.

In terms of timing, video engagement increased toward the later part of the course and peaked as the Power BI assignment deadline approached. Activity was also concentrated on weekends, which may reflect the study rhythms of adult learners combining studies with work and other responsibilities. This temporal pattern is shown in **Figure 3**.

Figure 3
Video Viewing Activity Over the Duration of the Course



At the level of individual videos, some variation was also visible. The most substantial viewing time was associated with videos that addressed central Power BI functions rather than introductory installation guidance. This suggests that students particularly engaged with those parts of the material that were most directly connected to task performance, although this interpretation should be treated cautiously and remains tentative.

In addition to video data, student activity was examined through Moodle log entries. Moodle activity showed clear variation over the course timeline. Activity was high at the beginning of the course, then declined during the middle phase, and rose again around major submission points. This pattern is likely related to the course structure: once students moved more intensively into Power BI practice, a larger share of their work took place outside Moodle, making some learning activity less visible in the platform log.

A further practical observation emerged from the Moodle data: the usefulness of analytics depends strongly on how the learning environment has been designed. In this course, the Moodle implementation did not fully support more detailed analytics interpretation. As a result, activity could be measured at a general level, but not always in a way that would allow fine-grained conclusions about specific learning behaviours. This is an important design issue for future course development.

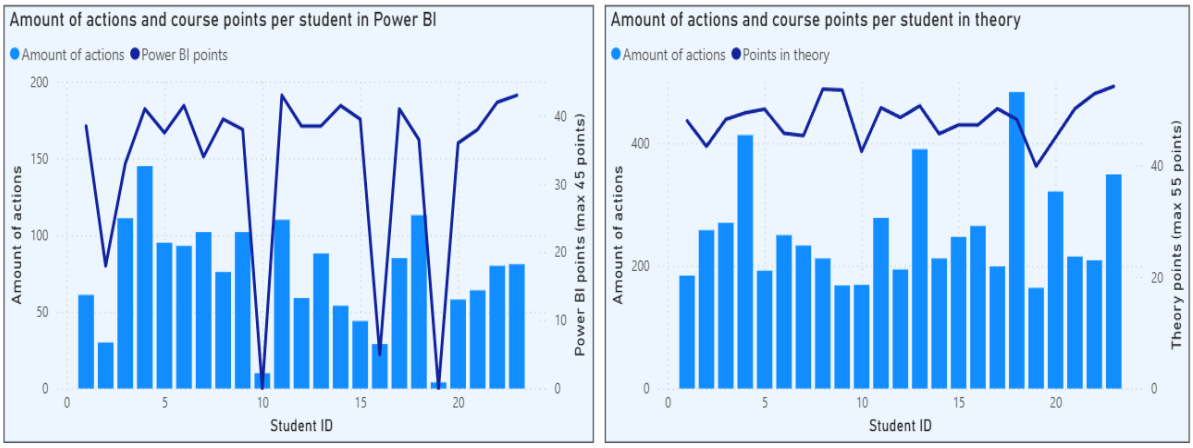
Activity and Course Performance

When Moodle activity was compared with students' assignment points, no clear overall relationship was observed in the descriptive analysis. Students differed considerably in their recorded activity, but the point distribution remained relatively high for most students. This may partly reflect the assessment structure of the course: when most students receive relatively strong scores, the point scale does not differentiate performance clearly enough to reveal strong patterns.

A more detailed comparison, however, suggested that the relationship between activity and performance differed across content areas. In the theoretical knowledge management part of the course, students generally performed well regardless of their visible Moodle activity. In the Power BI section, lower activity seemed more often to coincide with weaker task performance, although there were also students who performed well with relatively little recorded Moodle activity. One plausible interpretation is that prior experience with Power BI or similar applications may explain some of this variation.

This comparison is summarized in **Figure 4**.

Figure 4
Moodle Activity and Task Performance in the Power BI Section and the Knowledge Management Theory Section



Taken together, these results suggest that analytics related to technical application learning may be more directly interpretable than analytics related to more conceptual course content. At the same time, the results also underline that recorded platform activity does not capture all relevant learning effort.

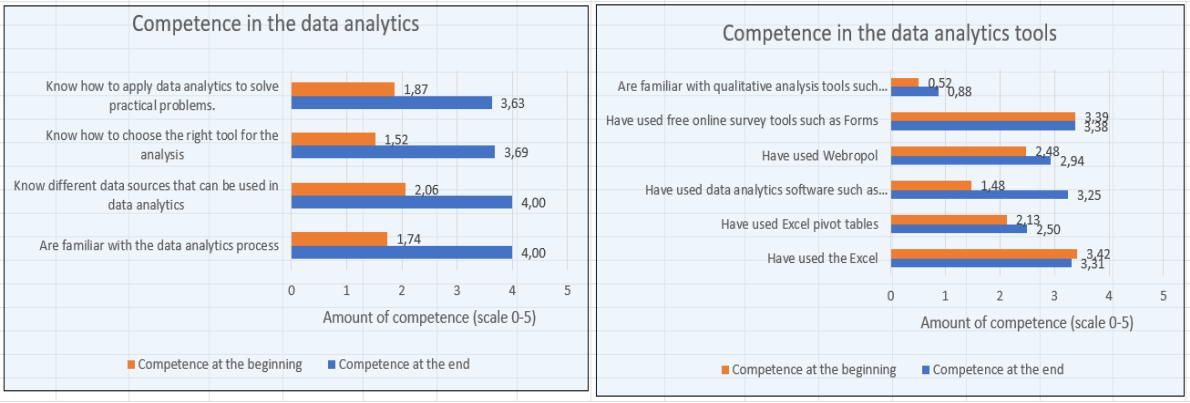
Students' Self-Assessed Competence After the Course

At the end of the course, students again assessed their competence in the same three areas. Across all content domains, self-assessed competence increased from the pre-course level. Students thus perceived that they had learned during the course.

The strongest increase was found in the basics of data analytics, where the mean self-assessment rose from 1.80 to 3.83. In knowledge management theory, the mean increased from 2.76 to 3.85. In analytics-related applications, the increase was more moderate, from 2.24 to 2.71 overall. This more limited change is understandable, given that the applications category included both familiar tools such as Excel and less familiar tools such as Power BI. Within that category, the most notable perceived improvement concerned Power BI, which was a major focus of the course.

The overall before-and-after comparison is shown in **Figure 5**.

Figure 5
Students' Self-Assessed Competence Before and After the Course Across the Three Main Content Areas

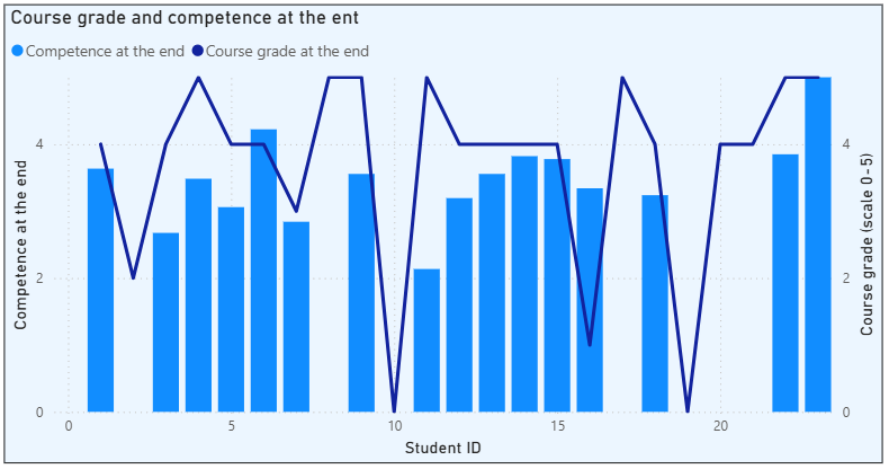


When end-of-course self-assessments were compared with final grades, students' views of their own competence appeared less critical than at the beginning of the course. Even so, self-assessed competence still tended to remain somewhat lower than formal course grades. This suggests that students became more confident through the course, but many still judged their own competence conservatively.

A more detailed comparison of end-of-course self-assessment and final grades is presented in **Figure 6**.

Figure 6

Students' End-of-Course Self-Assessed Competence in Relation to Final Course Grades



Discussion

The contribution of this study lies in combining learning analytics with self-assessed competence in an adult learning context. The study examines what learning analytics reveals about adult students in online higher education when system-generated data is combined with students' own competence assessments. Three main observations can be identified.

First, students entered the course with relatively cautious views of their competence, especially in data analytics and analytics-related applications. This is an important finding. Adult learners may begin online courses with lower confidence than their later performance would suggest. In this case, students' initial self-assessments did not clearly correspond to eventual course success. This implies that low starting confidence should not be interpreted too quickly as a sign of limited ability.

Second, learning analytics made visible substantial differences in study practices during the course. Students varied in how much video material they watched, when they studied, and how much activity appeared in the Moodle log. Weekend peaks and deadline-related surges suggest that flexibility is central in adult online learning. This supports earlier research emphasizing the importance of flexible course design, self-regulation, and teaching practices that accommodate different participation rhythms (Kuluşaklı, 2025; Viberg et al., 2020).

Third, the study shows both the value and the limits of learning analytics. Analytics data offered useful insights into activity patterns, engagement with video materials, and broad relationships between platform activity and task performance. At the same time, the interpretive power of analytics remained dependent on course design and technical implementation. Not all meaningful learning activity becomes visible in platform logs, and weak differentiation in course assessment can make it difficult to identify clearer relationships between engagement and success.

The findings also have pedagogical implications. In this case, learning related to technical application use, especially Power BI, appeared more visible in course activity and performance patterns than learning related to more conceptual content. This may suggest that technical skills produce clearer behavioural traces and performance distinctions in online environments. However, this should be interpreted as a contextual observation rather than a universal rule.

More broadly, the results suggest that learning analytics is most useful when it is integrated into course design from the beginning. If teachers want to use analytics meaningfully, they need to consider not only what can be measured, but also how the structure of the course, the assessment model, and the learning environment shape what becomes visible in the data. The findings should be interpreted as context-specific observations rather than generalizable conclusions.

Limitations

This study has several limitations. First, it is based on one course and a relatively small group of students, which limits the generalizability of the findings. Second, the pre-course and post-course survey respondents did not fully overlap with the students who generated course activity data, so the self-assessment results should be interpreted as indicative rather than as fully matched longitudinal measures for every participant. Third, the analysis was descriptive rather than predictive or inferential, which means that the results identify patterns but do not establish causal relationships. Fourth, the Moodle implementation did not support more fine-grained interpretation of analytics, which restricted what could be concluded from the platform data.

Despite these limitations, the study demonstrates how combining analytics with student self-assessment can provide a useful, practice-oriented perspective on adult online learning.

Conclusion

This study examined adult students' online learning in one higher education course by combining survey-based self-assessments with learning analytics derived from Moodle and Panopto. The results show that students assessed their initial competence rather critically, especially in data analytics and analytics-related applications, but reported clear improvement by the end of the course. Initial self-assessments did not appear to clearly predict course success.

Learning analytics revealed substantial variation in study practices during the course. Students differed in how much video material they watched and how actively they used the learning platform, and study activity was concentrated particularly around weekends and deadlines. At the same time, the study showed that the interpretive value of analytics depends heavily on course design, assessment structure, and the technical implementation of the learning environment.

For higher education teachers, the findings suggest that learning analytics can support understanding of adult students' engagement and progression, but only when interpreted in context. Analytics should therefore be seen not as a self-sufficient measure of learning, but as one source of evidence that becomes most useful when combined with pedagogical judgment and student perspectives.

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

The authors declare that ChatGPT (OpenAI), an AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The authors further declare that, apart from ChatGPT (OpenAI), no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Allione, G., & Stein, R. M. (2016). Mass attrition: An analysis of dropout from principles of microeconomics MOOC. *The Journal of Economic Education, 47*(2), 174–186. https://doi.org/10.1080/00220485.2016.1146096

de Barba, P. G., Kennedy, G. E., & Ainley, M. D. (2016). The role of students' motivation and participation in predicting performance in a MOOC. *Journal of Computer Assisted Learning, 32*(3), 218–231. https://doi.org/10.1111/jcal.12130

Haarala-Muhonen, A., Asikainen, H., Katajavuori, N., Kinnunen, P., Ripatti-Torniainen, L., & Tuononen, T. (2025). University students' experiences of fully online teaching and learning environments: Differences among learning profiles. *Frontiers in Education, 10*, Article 1520120. https://doi.org/10.3389/feduc.2025.1520120

Jiang, S., Warschauer, M., Williams, A. E., O'Dowd, D., & Schenke, K. (2014). Predicting MOOC performance with week 1 behavior. In *Proceedings of the 7th International Conference on Educational Data Mining* (pp. 273–275).

Kuluşaklı, E. (2025). Student engagement and flexibility in distance learning in higher education. *SAGE Open, 15*(1).

Mäkipää, T., Hildén, R., & Samulin, T. (2022). The perceptions of student teachers of online pedagogical courses and assessment practices in Finnish subject teacher education. *Education Sciences, 12*(6), Article 389. https://doi.org/10.3390/educsci12060389

Masiello, I., Mohseni, Z., Palma, F., Nordmark, S., Augustsson, H., & Rundquist, R. (2024). A current overview of the use of learning analytics dashboards. *Education Sciences, 14*(1), Article 82. https://doi.org/10.3390/educsci14010082

Palanci, A., Yılmaz, R., & Turan, Z. (2024). Learning analytics in distance education: A systematic review study. *Education and Information Technologies, 29*, 22629–22650. https://doi.org/10.1007/s10639-024-12737-5

Pursel, B. K., Zhang, L., Jablokow, K. W., Choi, G. W., & Velegol, D. (2016). Understanding MOOC students: Motivations and behaviours indicative of MOOC completion. *Journal of Computer Assisted Learning, 32*(3), 202–217. https://doi.org/10.1111/jcal.12131

Ramesh, A., Goldwasser, D., Huang, B., Daumé III, H., & Getoor, L. (2014). Learning latent engagement patterns of students in online courses. In *Proceedings of the Twenty-Eighth AAAI Conference on Artificial Intelligence* (pp. 1272–1278).

Sinha, T., Jermann, P., Li, N., & Dillenbourg, P. (2014). Your click decides your fate: Inferring information processing and attrition behavior from MOOC video clickstream interactions. In *Proceedings of the 2014 Conference on Empirical Methods in Natural Language Processing* (pp. 3–14).

Viberg, O., Khalil, M., & Baars, M. (2020). Self-regulated learning and learning analytics in online learning environments: A review of empirical research. In *Proceedings of the 10th International Conference on Learning Analytics & Knowledge* (pp. 524–533). https://doi.org/10.1145/3375462.3375483

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Mindfulness and Social Support in Neurodiversity-Affirming Higher Education Programs

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Abstract

Students with autism and other neurodivergent identities experience elevated levels of anxiety, depression, and social isolation in higher education settings, often compounded by environments that prioritize normalization over inclusion. Emerging educational and mental-health literature suggests that mindfulness-based practices and structured peer support may enhance emotional regulation, self-advocacy, and sense of belonging; however, these interventions are frequently adapted from neurotypical models and may not sufficiently account for neurodivergent communication styles, sensory processing differences, or social fatigue. This presentation describes a structured, neurodiversity-affirming support model implemented within a university-based program for neurodivergent students. The model integrates mindfulness practices, explicitly scaffolded social support, and predictable group structure to foster psychological safety, emotional awareness, and relational connection. Mindfulness is conceptualized not as attentional suppression or emotional control, but as an adaptive skill for noticing internal states, sensory needs, and stress responses in ways that honor neurodivergent experiences. Social support is operationalized through facilitated group dialogue, shared meaning-making, and explicit norms that reduce social ambiguity and performance pressure. Preliminary program outcomes are informed by standardized self-report measures of emotional well-being and self-esteem, alongside qualitative feedback reflecting increased self-confidence, peer connection, and coping flexibility. Findings highlight the importance of consistency, transparency, and collaborative meaning-making when implementing mindfulness and social support interventions with neurodivergent learners. This work contributes to international conversations on inclusive education by offering a replicable, neurodiversity-affirming framework that integrates mental-health support within academic environments. Implications for educators, clinicians, and program developers are discussed, with attention to culturally responsive and globally adaptable practices in institutions.

Keywords: neurodiversity, autism, higher education, mindfulness, social support, belonging, self-advocacy

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Introduction

Students entering higher education are expected to adapt quickly to academic, social, emotional, and environmental demands. These expectations can be particularly complex for neurodivergent students, including autistic students, students with attention-deficit/hyperactivity disorder, learning differences, sensory processing differences, and other forms of cognitive and developmental diversity. Although many institutions have expanded disability services and academic accommodations, neurodivergent students continue to report barriers related to social belonging, executive functioning, sensory overload, anxiety, depression, and difficulty accessing support that meaningfully reflects their lived experiences.

Traditional models of support in higher education often emphasize academic accommodations, such as extended testing time, note-taking assistance, or reduced-distraction testing environments. While these accommodations are important, they may not fully address the broader emotional and relational conditions that shape student success. For many neurodivergent students, the college transition involves not only academic adjustment but also navigation of unfamiliar social expectations, unstructured time, unclear communication norms, and environments that may be sensory overwhelming or socially exhausting. As a result, neurodivergent students may experience significant stress even when they are academically capable and motivated.

A neurodiversity-affirming approach offers an alternative framework for understanding these challenges. Rather than locating difficulty solely within the student, this approach examines the interaction between the student and the environment. From this perspective, anxiety, isolation, or reduced participation may not reflect a lack of motivation or social interest, but rather the cumulative impact of inaccessible environments, ambiguous expectations, masking demands, and limited opportunities for authentic peer connection. Neurodiversity-affirming higher education programs therefore aim not to normalize neurodivergent students but to create conditions in which students can understand their needs, advocate for support, and participate in ways that honor their communication styles, sensory profiles, and identities.

This paper describes a structured support model that integrates mindfulness practices and scaffolded social support within a neurodiversity-affirming higher education program. The model frames mindfulness not as a tool for emotional suppression or behavioral compliance, but as a practice of adaptive awareness. Students are invited to notice internal states, sensory needs, stress signals, and boundaries in ways that support self-understanding and self-advocacy. Social support is similarly structured to reduce ambiguity and performance pressure through predictable routines, facilitated dialogue, explicit group norms, and multiple modes of participation. Together, these practices aim to foster emotional well-being, self-esteem, coping flexibility, and belonging among neurodivergent college students.

Neurodivergent Students in Higher Education

The growing presence of neurodivergent students in higher education has increased the need for campus programs that address both academic access and psychosocial well-being. Research on autistic students in college and university settings has identified several recurring challenges, including transition stress, limited social support, co-occurring mental health concerns, disclosure concerns, and difficulty navigating institutional systems. Cai and Richdale (2016), for example, found that autistic students often reported being more supported

academically than socially, suggesting that institutional support structures may overlook the relational and emotional dimensions of student success.

Similarly, Van Hees et al. (2015) found that students with autism spectrum disorder described both benefits and challenges in higher education, including opportunities for independence and intellectual growth as well as difficulty with social integration, planning, disclosure, and mental health. These findings suggest that higher education can be both empowering and demanding for neurodivergent students. Students may thrive when they have access to meaningful academic opportunities, yet struggle when expected to navigate unclear expectations, sensory demands, and social environments without sufficient support.

Mental health is a central concern in this context. Neurodivergent students may experience anxiety and depression related to academic pressure, loneliness, identity-based stigma, and the effort required to mask or camouflage their needs. Masking may allow students to appear outwardly successful while internally experiencing exhaustion, disconnection, or distress. In higher education settings that reward independence, social fluency, and rapid adaptation, neurodivergent students may feel pressure to conceal differences rather than seek support. This can contribute to isolation and reduce opportunities for authentic peer connection.

Belonging is therefore a critical outcome for neurodiversity-affirming higher education programs. A student's ability to remain enrolled, engage academically, and develop confidence is shaped not only by grades or accommodations, but also by whether the student feels understood, valued, and connected. Pesonen et al. (2023) emphasized the importance of examining autistic students' sense of belonging through a socio-political lens, highlighting that belonging is not merely an individual feeling but is shaped by institutional practices, social norms, and power. In this sense, programs that support neurodivergent students must address the environment as much as the individual.

Neurodiversity-Affirming Practice

A neurodiversity-affirming framework recognizes neurological differences as part of natural human variation while also acknowledging that neurodivergent people may experience disability, distress, and support needs. This distinction is important. Neurodiversity-affirming practice does not deny impairment or minimize student struggles. Rather, it resists the assumption that neurodivergent students should be helped only by becoming more neurotypical in their behavior, communication, or emotional expression.

Kapp et al. (2013) described neurodiversity as an approach that challenges deficit-only interpretations of autism and other forms of neurological difference. Dwyer (2022) further clarified that neurodiversity approaches have implications for research, education, and practice because they shift attention toward acceptance, access, and the social conditions that shape disability. In higher education, this means designing support models that value student agency, respect different communication styles, and avoid framing differences as a problem to be corrected.

Language is a key part of this framework. Bottema-Beutel et al. (2021) argued that autism research and practice can unintentionally reproduce ableist assumptions through language that frames autistic people as burdens, deficits, or problems to be solved. A neurodiversity-affirming paper, program, or intervention should therefore use respectful language, avoid pathologizing descriptions, and prioritize the perspectives of neurodivergent people

themselves. This includes recognizing that some individuals prefer identity-first language, such as "autistic student," while others may prefer person-first language, such as "student with autism." Programs should remain responsive to individual and community preferences rather than imposing a single linguistic standard.

The double empathy problem also informs neurodiversity-affirming practice. Milton (2012) proposed that social misunderstanding between autistic and non-autistic people is not simply the result of autistic social deficit, but rather a mutual difficulty arising from differences in experience, communication, and interpretation. Milton et al. (2022) later reflected on the importance of this concept for rethinking autism, communication, and support. In higher education programs, this means that social support should not be designed only to teach neurodivergent students to conform to neurotypical expectations. Instead, programs should create shared spaces where communication norms are made explicit, multiple forms of participation are accepted, and all participants are encouraged to engage in mutual understanding.

Mindfulness as Adaptive Awareness

Mindfulness is often described as the practice of paying attention to present-moment experience with openness and nonjudgment. In college settings, mindfulness-based practices are commonly used to reduce stress, improve emotional regulation, and support student well-being. However, when mindfulness is introduced to neurodivergent students without adaptation, it may unintentionally reproduce neurotypical assumptions about attention, stillness, body awareness, and emotional expression.

For example, some students may find extended silence uncomfortable, sitting still dysregulating, body scans confusing, or closed-eye exercises unsafe. Some neurodivergent students may experience alexithymia or difficulty identifying and describing emotions, making emotion-labeling exercises challenging. Others may have heightened sensory awareness and may become more distressed when asked to focus on internal sensations without sufficient grounding. Therefore, mindfulness practices must be adapted carefully to avoid increasing distress or creating another context in which students feel they are performing incorrectly. For students who experience alexithymia, virtual participation through Zoom may provide an additional scaffold for emotional awareness. Zoom-based mindfulness practices can incorporate written prompts, visual emotion charts, chat-based responses, private reflection, and additional processing time before students are asked to identify or describe internal states. In addition, the virtual environment affords students greater control over their sensory and social experience. Participants may choose to mute themselves, engage in self-regulatory behaviors such as stimming, or move freely without concern that these behaviors will distract others or draw unwanted attention. This flexibility can reduce social pressure while promoting authentic participation and inclusion, allowing students to regulate themselves in ways that may not feel feasible in traditional face-to-face settings. These features may reduce the pressure to immediately verbalize emotions and allow students to approach emotional awareness through multiple pathways, including body sensations, sensory cues, energy levels, images, or written language. In this way, Zoom can function not merely as a delivery format, but as an accessibility tool that supports students who may find face-to-face emotional expression difficult or overwhelming while also providing a more sensory-affirming and neurodiversity-affirming environment.

Research suggests that mindfulness-based interventions may be promising for autistic individuals when adapted appropriately. Spek et al. (2013) conducted a randomized controlled trial of mindfulness-based therapy with adults on the autism spectrum and found reductions in depression, anxiety, and rumination, along with increases in positive affect. Braden et al. (2022) also examined mindfulness-based stress reduction with autistic adults and reported potential quality-of-life benefits. A recent systematic review by Simione et al. (2024) similarly identified mindfulness-based interventions as a growing area of interest for autistic populations, while also highlighting the need for careful adaptation and further research.

In the model described in this paper, mindfulness is conceptualized as adaptive awareness rather than attentional control. The purpose is not to make students calmer, quieter, or more compliant. Instead, mindfulness is used to help students notice stress signals, identify sensory thresholds, recognize emotional shifts, and develop language for support needs. Practices are brief, concrete, optional, and choice-based. Students may participate with eyes open or closed, seated or moving, verbally or silently, individually or in group reflection. They are reminded that there is no single correct way to engage in mindfulness. When sessions are delivered through Zoom, these mindfulness practices can be further adapted to support students with alexithymia. Facilitators may use screen-shared emotion wheels, sensory checklists, polls, chat responses, or private journaling prompts to help students identify internal states without requiring immediate verbal disclosure. For example, students may be invited to select from categories such as “low energy,” “overstimulated,” “uncertain,” “focused,” or “need a break” rather than being asked to name a specific emotion. This structure supports emotional literacy while avoiding the assumption that all students can easily translate internal experience into verbal emotion labels.

Examples of neurodiversity-affirming mindfulness practices include sensory check-ins, grounding with objects, mapping personal stress cues, noticing energy levels, identifying environmental triggers, and reflecting on what the body or mind may need in a given moment. A facilitator might ask, “What is one signal that tells you that you are becoming overwhelmed?” or “What kind of environment helps you feel more regulated?” These prompts move mindfulness away from abstract instruction and toward practical self-understanding.

This reframing is especially important in higher education. Students are often encouraged to push through stress, ignore sensory discomfort, or remain productive despite exhaustion. For neurodivergent students, mindfulness can become a way to interrupt this pattern by legitimizing internal experience. When students learn to notice their needs without judgment, they may become better able to request accommodations, set boundaries, use coping strategies, and recognize when an environment needs to be changed rather than endured.

Social Support as Structured Belonging

Social support is a well-established protective factor in mental health and stress adaptation. Cohen and Wills (1985) proposed that social support can buffer the negative impact of stress by providing emotional, informational, and practical resources. In college populations, social support has also been associated with better mental health and adjustment. Hefner and Eisenberg (2009) found that social support is an important factor in college student mental health, particularly in relation to depressive symptoms and perceived isolation.

For neurodivergent students, however, access to social support may be complicated by sensory stress, social ambiguity, fear of rejection, masking, and previous experiences of exclusion.

Many neurodivergent students want connection but may find typical social settings overwhelming or unclear. Informal socializing may require rapid conversational processing, interpretation of implicit norms, tolerance of unpredictable sensory input, and sustained performance of neurotypical social behavior. As a result, students may withdraw not because they lack interest in connection, but because available social environments are inaccessible.

Structured peer support can address this barrier by making connection more predictable and less performative. Hillier et al. (2018) evaluated a support group model for university students with autism spectrum disorder and found improvements in psychological and functional outcomes, including reductions in loneliness and anxiety and increases in self-esteem. Their findings support the value of structured group-based programs that address the social, emotional, and practical needs of autistic students in higher education.

In the model described here, social support is operationalized through facilitated group dialogue, explicit norms, and shared meaning-making. Group facilitators do not assume that students will naturally connect simply by being placed in the same room. Instead, the group environment is intentionally structured to reduce uncertainty. Sessions begin with a predictable opening, include a clear agenda, offer multiple ways to participate, and end with a consistent closing routine. Students are told what to expect, how long each activity will last, and what forms of participation are acceptable.

Explicit norms are central to this process. These may include permission to pass, permission to use written responses, permission to step out, respect for different communication styles, confidentiality, and recognition that silence can be a valid form of participation. These norms reduce pressure and help students engage at their own pace. They also communicate that belonging does not require constant verbal participation, eye contact, or social performance.

Peer normalization is another important mechanism. When students hear others describe similar experiences with sensory overload, executive functioning, loneliness, academic pressure, or masking, they may feel less alone and less defective. Shared meaning-making allows students to reinterpret experiences that may previously have been understood only as personal failures. For example, a student who struggles to attend loud social events may begin to understand this not as social inadequacy, but as a sensory and energy-management issue that can be planned for with greater self-compassion.

Program Model

The proposed support model includes three integrated components: predictable group structure, neurodiversity-affirming mindfulness, and scaffolded social support. These components are designed to work together to foster psychological safety, emotional awareness, self-advocacy, and relational connection.

Predictable Group Structure

Predictability is a foundational access feature. Each session follows a consistent structure: welcome, agenda review, brief check-in, mindfulness or grounding practice, facilitated discussion, strategy-building, reflection, and closing. This format helps reduce uncertainty and allows students to prepare cognitively and emotionally for participation. Predictability is especially important for students who experience anxiety related to transitions, ambiguity, or unexpected social demands.

The facilitator also previews the purpose of each activity. For example, before a mindfulness exercise, the facilitator explains what will happen, how long it will last, and how students may modify or opt out of the practice. Before a discussion, the facilitator may provide sample responses, written prompts, or time for individual reflection. These scaffolds reduce performance pressure and make participation more accessible.

Neurodiversity-Affirming Mindfulness

Mindfulness practices are brief, concrete, and choice-based. Rather than requiring students to sit still or focus on breathing in a prescribed way, students are offered multiple options. A grounding exercise may include noticing objects in the room, feeling one's feet on the floor, using a sensory item, stretching, or identifying one environmental factor that feels supportive or stressful. Students may share reflections verbally, write them privately, or simply observe.

The content of mindfulness practices emphasizes noticing needs rather than controlling emotions. Students are encouraged to ask: What am I noticing in my body? What is my energy level? What sensory input is affecting me? What kind of support would help right now? What boundary might I need? These questions support emotional awareness, interoceptive reflection, and self-advocacy.

Scaffolded Social Support

Social support is built through facilitated dialogue and shared reflection. Topics may include transition to college, managing sensory overload, navigating group projects, communicating with professors, coping with burnout, understanding masking, building friendships, and asking for help. Discussions are structured with clear prompts and flexible participation options.

Students are also invited to share strategies with one another. This peer exchange positions students as knowledge-holders rather than passive recipients of services. A student who has developed a helpful routine for managing executive functioning, for example, may offer practical insight to peers. Another student may share language they used to request accommodations or explain sensory needs. These exchanges strengthen peer connection while validating neurodivergent expertise.

Evaluation Approach

A mixed-methods evaluation approach is appropriate for examining the impact of this model. Quantitative measures may include self-report assessments of emotional well-being, self-esteem, loneliness, anxiety, belonging, or coping. The Warwick-Edinburgh Mental Well-being Scale may be used to assess positive mental well-being, while the Rosenberg Self-Esteem Scale may be used to assess global self-esteem. Depending on program goals, additional measures of anxiety, depression, loneliness, or campus belonging may also be included.

Qualitative data are equally important because standardized measures may not fully capture the lived experiences of neurodivergent students. Open-ended survey responses, reflection prompts, focus groups, and facilitator observations can provide insight into how students experience the group. Qualitative feedback may identify themes such as feeling understood, increased confidence, improved coping flexibility, greater willingness to seek support, or reduced shame related to neurodivergent needs.

For the present program model, preliminary outcomes are informed by standardized self-report measures of emotional well-being and self-esteem, alongside qualitative feedback from student participants. Given the exploratory nature of the evaluation, findings should be interpreted cautiously. Small sample sizes, self-selection, lack of randomization, and reliance on self-report may limit generalizability. However, preliminary findings can still provide valuable practice-based evidence and guide future program development.

Preliminary Outcomes

Preliminary program feedback suggests that students experienced the group as a supportive and validating environment for discussing stress, sensory needs, academic challenges, and social connection. Students described benefits related to increased self-confidence, greater awareness of emotional and sensory states, and improved ability to identify coping strategies. Qualitative feedback also reflected the importance of peer connection, particularly the experience of being understood by others with similar experiences.

Students appeared to benefit from the predictable structure of the group. The consistent format reduced uncertainty and allowed students to anticipate what would happen in each session. This structure may have contributed to psychological safety by decreasing ambiguity and allowing students to engage without needing to constantly interpret changing social expectations.

Mindfulness practices were most useful when they were concrete, brief, and flexible. Students responded positively to practices that allowed them to notice sensory needs, identify stress signals, and choose regulation strategies. This suggests that mindfulness may be more accessible for neurodivergent students when it is framed as self-awareness and self-advocacy rather than emotional control.

Peer dialogue also emerged as a central feature of the model. Students benefited from hearing that others shared similar experiences with overwhelm, masking, social fatigue, and academic stress. These conversations helped normalize student experiences and created opportunities for shared problem-solving. The group therefore functioned not only as a coping-skills intervention but also as a space for identity affirmation and relational belonging.

Discussion

The model described in this paper contributes to inclusive higher education by reframing mindfulness and social support as neurodiversity-affirming practices. Rather than using mindfulness to encourage students to suppress distress or conform to neurotypical expectations, the model uses mindfulness to support awareness of internal states, sensory needs, and boundaries. Rather than treating social support as informal socialization, the model structures peer connection through explicit norms, predictable routines, and facilitated dialogue.

This distinction matters because neurodivergent students are often asked to adapt to inaccessible environments without sufficient institutional change. A student experiencing sensory overload may be encouraged to “cope better” without attention to environmental design. A student experiencing loneliness may be encouraged to “join clubs” without recognition that typical social settings may be ambiguous, exhausting, or exclusionary. A neurodiversity-affirming model avoids placing sole responsibility on the student and instead creates supportive conditions in which students can participate authentically.

The integration of mindfulness and social support is especially promising because these practices address different but related dimensions of student well-being. Mindfulness supports self-awareness, regulation, and self-advocacy. Social support addresses isolation, belonging, and shared meaning-making. Together, they help students recognize their own needs while also experiencing connection with others. This combination may be particularly valuable in higher education, where students are navigating both internal stress and external social demands.

The model also aligns with broader movements toward inclusive pedagogy and universal design. Predictability, transparency, flexible participation, and multiple modes of communication benefit neurodivergent students while also improving accessibility for many learners. These practices reduce unnecessary cognitive and social load, clarify expectations, and communicate respect for diverse ways of engaging.

Implications for Educators, Clinicians, and Program Developers

Educators can apply this model by creating classrooms that include predictable routines, explicit expectations, and flexible participation options. For example, faculty can provide agendas, offer discussion questions in advance, allow written or chat-based participation, and avoid assuming that verbal participation is the only indicator of engagement. These practices support neurodivergent students while also benefiting students with anxiety, language differences, trauma histories, or other access needs. Virtual platforms such as Zoom may also expand accessibility when used intentionally. Features such as chat, captions, screen sharing, polls, reactions, and camera-optional participation can reduce social pressure and create multiple pathways for engagement. For students with alexithymia, these tools may be particularly helpful because they allow students to respond through written language, visual cues, or structured options rather than relying only on spontaneous verbal emotion identification. Educators and clinicians should therefore consider virtual participation not only as a convenience, but as a potential accommodation that can support emotional awareness, communication, and belonging.

Clinicians and counselors working in higher education can adapt mindfulness-based practices by making them concrete, sensory-aware, and choice-based. Rather than beginning with abstract instructions to focus on the breath, clinicians might invite students to identify environmental stressors, notice energy levels, or develop personalized grounding plans. Clinicians should also assess whether mindfulness practices are experienced as calming, neutral, confusing, or distressing, and should modify practices accordingly.

Program developers can use this model to design group-based supports that foster belonging without requiring neurotypical social performance. Programs should include student input, transparent norms, flexible attendance expectations, and options for both verbal and nonverbal participation. Facilitators should be trained in neurodiversity-affirming language, sensory access, trauma-informed practice, and collaborative group facilitation.

Cultural responsiveness is also essential. Neurodivergent students' experiences are shaped by culture, race, gender, language, socioeconomic status, family expectations, and local disability norms. In some cultural contexts, disclosure of disability or mental health concerns may carry significant stigma. In others, family involvement may be central to student support. A globally adaptable model should therefore avoid assuming that one form of participation, identity language, or peer support structure will fit all students. Instead, programs should be developed collaboratively with students and adapted to local institutional and cultural contexts.

Limitations and Future Directions

The present paper describes a preliminary program model and should be interpreted as practice-based and exploratory. Future research should examine the effectiveness of neurodiversity-affirming mindfulness and social support programs using larger samples, longitudinal designs, and comparison groups. Studies should also examine which components of the model are most effective for different students. For example, some students may benefit most from predictable structure, while others may benefit most from peer connection, sensory awareness, or self-advocacy practice.

Future evaluation should also include student-led research methods. Neurodivergent students should be involved in designing, implementing, and interpreting program evaluation. Their perspectives are essential for determining whether a program is truly affirming or merely inclusive in language. Participatory approaches can help ensure that program goals reflect student priorities rather than institutional assumptions.

Additional research is also needed on culturally responsive adaptations. Much of the existing literature on autism, mindfulness, and higher education comes from Western contexts. Internationally oriented work should examine how neurodiversity-affirming practices can be adapted across different educational systems, cultural expectations, disability policies, and mental health frameworks.

Conclusion

Neurodivergent students deserve higher education environments that support not only academic achievement but also emotional well-being, self-understanding, and belonging. Mindfulness and social support can contribute to these goals when they are implemented through a neurodiversity-affirming framework. In this model, mindfulness is not a tool for normalization or emotional suppression, but a practice of adaptive awareness. Social support is not left to chance, but is intentionally scaffolded through predictable structure, explicit norms, and multiple forms of participation.

Preliminary program outcomes suggest that students may experience increased confidence, peer connection, coping flexibility, and awareness of emotional and sensory needs when mindfulness and social support are embedded in consistent, transparent, and affirming environments. These findings support the continued development of higher education programs that honor neurodivergent experience and shift responsibility for inclusion from individual students to the broader educational community.

References

Bottema-Beutel, K., Kapp, S. K., Lester, J. N., Sasson, N. J., & Hand, B. N. (2021). Avoiding ableist language: Suggestions for autism researchers. *Autism in Adulthood, 3*(1), 18–29. https://doi.org/10.1089/aut.2020.0014

Braden, B. B., Pagni, B. A., Monahan, L., Walsh, M. J. M., Dixon, M. V., Delaney, S., Ballard, L., & Ware, J. E. (2022). Quality of life in adults with autism spectrum disorder: Influence of age, sex, and a controlled, randomized mindfulness-based stress reduction pilot intervention. *Quality of Life Research, 31*(5), 1427–1440. https://doi.org/10.1007/s11136-021-03013-x

Cai, R. Y., & Richdale, A. L. (2016). Educational experiences and needs of higher education students with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 46*(1), 31–41. https://doi.org/10.1007/s10803-015-2535-1

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310–357. https://doi.org/10.1037/0033-2909.98.2.310

Crompton, C. J., Hallett, S., Axbey, H., McAuliffe, C., & Cebula, K. (2023). "Someone like-minded in a big place": Autistic young adults' attitudes towards autistic peer support in mainstream education. *Autism, 27*(1), 76–91. https://doi.org/10.1177/13623613221081189

Davis, M. T., Watts, G. W., & López, E. J. (2021). A systematic review of firsthand experiences and supports for students with autism spectrum disorder in higher education. *Research in Autism Spectrum Disorders, 84*, Article 101769. https://doi.org/10.1016/j.rasd.2021.101769

Dwyer, P. (2022). The neurodiversity approach(es): What are they and what do they mean for researchers? *Human Development, 66*(2), 73–92. https://doi.org/10.1159/000523723

Gelbar, N. W., Smith, I., & Reichow, B. (2014). Systematic review of articles describing experience and supports of individuals with autism enrolled in college and university programs. *Journal of Autism and Developmental Disorders, 44*(10), 2593–2601. https://doi.org/10.1007/s10803-014-2135-5

Goddard, H., & Cook, A. (2022). "I spent most of freshers in my room": A qualitative study of the social experiences of university students on the autistic spectrum. *Journal of Autism and Developmental Disorders, 52*, 2701–2716. https://doi.org/10.1007/s10803-021-05125-2

Gurbuz, E., Hanley, M., & Riby, D. M. (2019). University students with autism: The social and academic experiences of university in the UK. *Journal of Autism and Developmental Disorders, 49*(2), 617–631. https://doi.org/10.1007/s10803-018-3741-4

Hefner, J., & Eisenberg, D. (2009). Social support and mental health among college students. *American Journal of Orthopsychiatry, 79*(4), 491–499. https://doi.org/10.1037/a0016918

Hillier, A., Goldstein, J., Murphy, D., Trietsch, R., Keeves, J., Mendes, E., & Queenan, A. (2018). Supporting university students with autism spectrum disorder. *Autism, 22*(1), 20–28. https://doi.org/10.1177/1362361317699584

Kapp, S. K., Gillespie-Lynch, K., Sherman, L. E., & Hutman, T. (2013). Deficit, difference, or both? Autism and neurodiversity. *Developmental Psychology, 49*(1), 59–71. https://doi.org/10.1037/a0028353

Milton, D. E. M. (2012). On the ontological status of autism: The "double empathy problem." *Disability & Society, 27*(6), 883–887. https://doi.org/10.1080/09687599.2012.710008

Milton, D., Gurbuz, E., & Lopez, B. (2022). The "double empathy problem": Ten years on. *Autism, 26*(8), 1901–1903. https://doi.org/10.1177/13623613221129123

Pesonen, H. V., Nieminen, J. H., Vincent, J., Waltz, M., Lahdelma, M., Syurina, E. V., & Fabri, M. (2023). A socio-political approach on autistic students' sense of belonging in higher education. *Teaching in Higher Education, 28*(4), 739–757. https://doi.org/10.1080/13562517.2020.1852205

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton University Press.

Simione, L., Frolli, A., Sciattella, F., & Chiarella, S. G. (2024). Mindfulness-based interventions for people with autism spectrum disorder: A systematic literature review. *Brain Sciences, 14*(10), Article 1001. https://doi.org/10.3390/brainsci14101001

Spek, A. A., van Ham, N. C., & Nyklíček, I. (2013). Mindfulness-based therapy in adults with an autism spectrum disorder: A randomized controlled trial. *Research in Developmental Disabilities, 34*(1), 246–253. https://doi.org/10.1016/j.ridd.2012.08.009

Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., Parkinson, J., Secker, J., & Stewart-Brown, S. (2007). The Warwick-Edinburgh Mental Well-being Scale: Development and UK validation. *Health and Quality of Life Outcomes, 5*, Article 63. https://doi.org/10.1186/1477-7525-5-63

Van Hees, V., Moyson, T., & Roeyers, H. (2015). Higher education experiences of students with autism spectrum disorder: Challenges, benefits and support needs. *Journal of Autism and Developmental Disorders, 45*(6), 1673–1688. https://doi.org/10.1007/s10803-014-2324-2

White, S. W., Elias, R., Salinas, C. E., Capriola, N., Conner, C. M., Asselin, S. B., Miyazaki, Y., Mazefsky, C. A., Howlin, P., & Getzel, E. E. (2016). Students with autism spectrum disorder in college: Results from a preliminary mixed methods needs analysis. *Research in Developmental Disabilities, 56*, 29–40. https://doi.org/10.1016/j.ridd.2016.05.010

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The Mediating Role of Innovativeness in the Relationship Between Teachers' Proactive Personality and Digital Literacy Perceptions

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Abstract

This study examined the mediating role of individual innovativeness in the relationship between teachers' proactive personality and digital literacy perceptions, using a correlational survey design. The sample consisted of 322 teachers working in schools affiliated with the Ministry of National Education in Gaziantep, Türkiye, selected through convenience sampling. Data were collected online using the Proactive Personality Scale, the Digital Literacy Skills Scale, and the Individual Innovativeness Scale, and analyzed using descriptive statistics, independent-samples *t* tests, one-way ANOVA, Pearson correlation, multiple linear regression, and Hayes' PROCESS Macro (Model 4; 5,000 bootstrap samples). Results revealed positive and significant relationships between proactive personality and digital literacy ($r = .417$, $p < .01$), proactive personality and innovativeness ($r = .488$, $p < .01$), and innovativeness and digital literacy ($r = .342$, $p < .01$). Proactive personality ($\beta = .329$, $p < .001$) and innovativeness ($\beta = .181$, $p = .002$) significantly predicted digital literacy, explaining 19.9% of variance ($R^2 = .199$, $F(2, 319) = 39.628$, $p < .001$). Mediation analysis showed that both the total effect ($B = .428$, $\beta = .417$, $p < .001$) and the direct effect ($B = .337$, $\beta = .329$, 95% CI [.221, .453]) were significant, and the indirect effect through innovativeness was also significant ($B = .091$, 95% CI [.032, .159]), indicating partial mediation. No significant differences emerged across gender, age, seniority, school tenure, or school level (all $p > .05$). These findings highlight the importance of fostering proactive personality and innovativeness to enhance teachers' digital literacy.

Keywords: teacher, proactive personality, digital literacy, innovativeness, education

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Introduction

In the rapidly transforming world of the 21st century, the teaching profession has evolved beyond the mere transmission of knowledge to encompass the design and facilitation of learning processes as well as leadership in educational change (Darling-Hammond, 2006; Schleicher, 2018). One of the key constructs associated with this transformation is proactive personality, which refers to an individual's tendency to initiate change by recognizing opportunities rather than passively accepting existing conditions. Proactive personality is defined as an individual's tendency to take initiative to influence their environment, identify opportunities, and sustain efforts until meaningful change is achieved (Bateman & Crant, 1993; Crant, 2000). Rather than accepting existing conditions, proactive individuals seek to improve them, develop a vision for the future, and engage in behaviors aimed at influencing their environment (Crant, 2000). Accordingly, proactive personality is regarded as a relatively stable behavioral disposition characterized by identifying opportunities, taking initiative, acting, and persisting until change is achieved (Bateman & Crant, 1993; Parker et al., 2006). Individuals with this personality trait actively shape their environment rather than simply adapting to existing conditions (Parker et al., 2006). In educational settings, teachers' proactive personality has been found to be positively associated with self-efficacy and openness to change. Teachers with higher levels of proactive personality demonstrate lower resistance to change and innovation in schools and participate more actively in change processes (Bozbayındır & Alev, 2018). In addition, proactive individuals are more willing to adopt new technologies, keep up with technological developments, and take initiative in the use of technology. Within educational settings, teachers with proactive characteristics are more likely to view technological innovations as opportunities and to take an active role in integrating them into teaching and learning processes (Kukal & Töre, 2024). In this context, digital literacy is likely to be associated with teachers' proactive personality.

According to Gilster (1997), digital literacy extends beyond technical skills to include the ability to critically evaluate and effectively use digital resources. Similarly, Eshet-Alkalai (2004) conceptualized digital literacy as a multidimensional construct encompassing photo-visual, reproduction, branching, information, and socio-emotional literacy, rather than merely technical operational skills. From this perspective, digital literacy is considered a fundamental life skill that enables individuals to access, evaluate, produce, and share information effectively (Fraillon et al., 2020). Falloon (2020) further argues that teacher education should move beyond a narrow focus on technical skills and adopt a broader perspective that enables teachers to integrate technology effectively into pedagogical processes. Accordingly, digital literacy encompasses not only the ability to use digital technologies but also the capacity to adapt to a rapidly changing digital environment, learn emerging technologies, and use them effectively for professional purposes. Therefore, digital literacy can be considered closely related to proactive behavioral tendencies (Ozkan-Hidiroglu et al., 2021).

Innovativeness may serve as an important mediating mechanism in this relationship. According to Rogers (2003), an innovation is an idea, practice, or object that is perceived as new by an individual or another unit of adoption. Innovativeness refers to an individual's tendency to adopt, develop, and implement new ideas (Hurt et al., 1977; Kılıçer & Odabaşı, 2010). In the teaching profession, innovativeness is reflected in trying new instructional methods, using digital tools for pedagogical purposes, diversifying learning environments, and adopting a development-oriented attitude rather than resisting change (Kılıçer & Odabaşı, 2010).

Previous research has shown that individuals with high levels of personal innovativeness are more willing to experiment with and adopt new technologies and develop more positive attitudes toward technology adoption (Agarwal & Prasad, 1998; Yi et al., 2006). Similarly, proactive personality has been identified as an important antecedent of innovative behavior. As teachers' proactive personality increases, their innovative work behaviors also increase (Ertürk, 2023; Pan et al., 2021; Siregar et al., 2026). Likewise, Bozbayındır and Alev (2018) reported that proactive personality is positively associated with teachers' openness to change. Because proactive individuals actively seek to improve their environment, they tend to be more receptive to innovative practices, which may increase their willingness to adopt and use new technologies. Accordingly, the influence of proactive personality on digital literacy may not be entirely direct but may operate through innovativeness. In other words, innovativeness may function as a mechanism through which proactive personality contributes to teachers' digital literacy.

Previous studies have also reported positive relationships between teachers' digital literacy and individual innovativeness (Çapraz, 2023; Özkurt, 2022). For example, Çapraz (2023) found a moderate, positive, and significant relationship between teachers' digital literacy and individual innovativeness. Similarly, Ocak and Kuş Serin (2024) reported that teachers' digital literacy and individual innovativeness together significantly predicted their information technology use. These findings suggest that individuals with stronger innovative tendencies are more willing to learn and adopt new technologies and are therefore better positioned to develop their digital literacy.

Although previous studies have examined proactive personality, innovativeness, and digital literacy, they have primarily focused on the direct relationships among these variables. Consequently, the psychological mechanisms underlying digital literacy remain underexplored. In particular, research examining the personality-based antecedents of digital literacy and the mechanisms through which these antecedents operate is limited. Examining teachers' digital literacy and innovativeness is important for understanding their capacity to adapt to educational change and integrate technology into teaching. This study is expected to contribute to the literature by explaining the psychological antecedents of digital literacy, identifying the individual characteristics that support teachers' adaptation to digital transformation, and providing practical implications for teacher education and professional development. Accordingly, this study aims to examine the mediating role of innovativeness in the relationship between teachers' proactive personality and digital literacy. To achieve this aim, the following research questions were addressed:

1. Do teachers' proactive personality, innovativeness, and digital literacy differ significantly according to gender, age, professional seniority, tenure at their current school, and school level?
2. What are the direction and strength of the relationships among teachers' proactive personality, innovativeness, and digital literacy?
3. Do proactive personality and innovativeness significantly predict teachers' digital literacy?
4. Does innovativeness mediate the relationship between proactive personality and digital literacy?

Method

Research Model

This study employed a correlational survey design, a quantitative research method, to examine the mediating role of individual innovativeness in the relationship between teachers' proactive personality and digital literacy. A correlational survey design is used to examine the relationships among two or more variables (Büyüköztürk et al., 2015). In the present study, proactive personality was treated as the independent variable, digital literacy as the dependent variable, and individual innovativeness as the mediating variable. The model tested whether individual innovativeness mediated the relationship between proactive personality and digital literacy.

Participant

The population of the study consisted of teachers working in schools affiliated with the Ministry of National Education in Gaziantep, Türkiye. The sample comprised 322 teachers who were selected through convenience sampling and voluntarily participated in the study. Of the participants, 57.1% were female and 42.9% were male. Regarding age, 28.6% were between 22 and 30 years, 36.6% were between 31 and 40 years, 24.8% were between 41 and 50 years, and 9.9% were 51 years or older. Professional seniority was distributed as follows: 28.6% had 1–5 years of experience, 23.0% had 6–10 years, 25.8% had 11–20 years, and 22.7% had more than 20 years of experience. Regarding tenure at the current school, 42.9% had worked there for 0–2 years, 26.7% for 3–5 years, 20.2% for 6–9 years, and 10.2% for 10 years or more. The participants worked at the preschool (9.3%), primary school (24.8%), middle school (30.1%), and high school (35.7%) levels.

Data Collection Instruments

The study used a Personal Information Form, the Brief Proactive Personality Scale, the Digital Literacy Skills Scale, and the Individual Innovativeness Scale.

Personal Information Form

The Personal Information Form was developed by the researcher and included items on participants' gender, age, professional seniority, tenure at their current school, and school level.

Short Proactive Scale

Teachers' proactive personality was measured using the Short Proactive Personality Scale developed by Bateman and Crant (1993) and adapted into Turkish by Akın et al. (2015). The scale consists of 10 items with a one-dimensional structure and is rated on a 7-point Likert scale. Higher scores indicate higher levels of proactive personality. In this study, the total score was used in the analyses. The Cronbach's alpha coefficient of the scale was .852.

Digital Literacy Skills Scale

Teachers' digital literacy was measured using the Digital Literacy Skills Scale developed by Özden et al. (2024). The scale consists of 15 items rated on a 5-point Likert scale and

includes three dimensions: *tool selection and guidance appropriate to the objective*, *critical reading*, and *safe and critical writing*. The total score was used in the analyses. The Cronbach's alpha coefficient of the scale was .899.

Individual Innovativeness Scale

Teachers' individual innovativeness was measured using the Individual Innovativeness Scale developed by Hurt et al. (1977) and adapted into Turkish by Kılıçer and Odabaşı (2010). The scale consists of 20 items. Higher scores indicate higher levels of individual innovativeness. The total score was used in the analyses. The Cronbach's alpha coefficient of the scale was .852.

Data Analysis

The data were analyzed using IBM SPSS Statistics 27. Before conducting the analyses, assumptions regarding normality, reliability, and outliers were examined. The internal consistency of the scales was assessed using Cronbach's alpha coefficients, which are reported in the relevant sections above.

Outliers were identified using standardized *z* scores, and no outlying observations were detected that could affect the analyses. Normality was assessed by examining skewness and kurtosis values. Skewness values ranged from −0.574 to −0.123, while kurtosis values ranged from 0.048 to 0.924. As these values were within the acceptable range, the data were considered normally distributed, and parametric statistical analyses were conducted.

To address the research questions, independent-samples *t* tests, one-way analysis of variance (ANOVA), Pearson correlation analysis, and multiple linear regression analysis were performed. The mediating role of individual innovativeness in the relationship between proactive personality and digital literacy was examined using Hayes' PROCESS Macro (Model 4). The significance of the indirect effect was evaluated using 5,000 bootstrap resamples and a 95% confidence interval. An indirect effect was considered significant when the confidence interval did not include zero (Hayes, 2017).

Findings

Findings Regarding the Descriptive Statistics of the Variables

The descriptive statistics regarding the variables are presented below.

Table 1
Descriptive Statistics for Teachers' Levels of Proactive Personality, Digital Literacy, and Innovativeness

Variable	N	M	SD	Min.	Max.	Score Range
Proactive Personality	322	55.93	7.40	27	70	10–70
Digital Literacy	322	57.40	7.60	15	75	15–75
Innovativeness	322	74.72	9.04	49	98	20–100

Note. SD = Standard deviation; Min. = Minimum score; Max. = Maximum score.

When Table 1 is examined, it can be seen that teachers' mean scores for proactive personality (M = 55.93, SD = 7.40), digital literacy (M = 57.40, SD = 7.60), and innovativeness (M = 74.72, SD = 9.04) are relatively high when the possible score ranges of the scales are taken into account.

Findings Regarding the First Research Question

The findings regarding the first research question are presented in turn below.

Table 2
Independent Samples t-Test Results by Gender

Variable	Gender	N	M	SD	t(320)	p
Proactive Personality	Female	184	56.35	7.25	1.157	.248
	Male	138	55.38	7.60		
Digital Literacy	Female	184	57.18	7.51	−0.603	.547
	Male	138	57.70	7.72		
Innovativeness	Female	184	74.32	8.97	−0.922	.357
	Male	138	75.25	9.12		

Note. M = Mean; SD = Standard deviation.

When Table 2 is examined, it was determined that teachers' proactive personality scores did not differ significantly by gender, t(320) = 1.157, p = .248. Similarly, no significant differences were found between female and male teachers in digital literacy, t(320) = −0.603, p = .547, or innovativeness scores, t(320) = −0.922, p = .357.

Table 3
One-Way ANOVA Results by Age

Variable	Age	N	M	SD	F(3, 318)	p	η^2
Proactive Personality	22–30	92	55.74	7.03	0.903	.440	.008
	31–40	118	56.69	6.88			
	41–50	80	54.96	8.90			
	51+	32	56.13	6.10			
Digital Literacy	22–30	92	57.71	7.32	0.201	.895	.002
	31–40	118	57.58	8.14			
	41–50	80	56.99	7.63			
	51+	32	56.88	6.38			
Innovativeness	22–30	92	73.42	9.07	0.898	.442	.008
	31–40	118	75.37	9.34			
	41–50	80	75.09	8.51			
	51+	32	75.09	9.09			

Note. M = Mean; SD = Standard deviation; η^2 = Eta squared.

When Table 3 is examined, it was determined that teachers' proactive personality scores did not differ significantly by age, F(3, 318) = 0.903, p = .440, η^2 = .008. Similarly, no significant

differences were found among age groups in digital literacy, F(3, 318) = 0.201, p = .895, η^2 = .002, or innovativeness scores, F(3, 318) = 0.898, p = .442, η^2 = .008.

Table 4
One-Way ANOVA Results by Professional Seniority

Variable	Seniority (years)	N	M	SD	F(3, 318)	p	η^2
Proactive Personality	1–5	92	55.59	6.48	2.416	.066	.022
	6–10	74	57.91	7.23			
	11–20	83	54.96	7.20			
	20+	73	55.48	8.58			
Digital Literacy	1–5	92	57.89	6.55	1.001	.392	.009
	6–10	74	57.99	9.69			
	11–20	83	56.18	6.95			
	20+	73	57.58	7.10			
Innovativeness	1–5	92	72.73	8.41	2.185	.090	.020
	6–10	74	75.84	10.07			
	11–20	83	75.14	8.52			
	20+	73	75.60	9.03			

Note. M = Mean; SD = Standard deviation; η^2 = Eta squared.

When Table 4 is examined, it was determined that teachers' proactive personality scores did not differ significantly by professional seniority, F(3, 318) = 2.416, p = .066, η^2 = .022. Similarly, no significant differences were found among professional seniority groups in digital literacy, F(3, 318) = 1.001, p = .392, η^2 = .009, or innovativeness scores, F(3, 318) = 2.185, p = .090, η^2 = .020.

Table 5
One-Way ANOVA Results by Tenure at the Current School

Variable	Tenure (years)	N	M	SD	F(3, 318)	p	η^2
Proactive Personality	0–2	138	55.82	6.80	0.438	.726	.004
	3–5	86	56.53	7.36			
	6–9	65	55.20	8.16			
	10+	33	56.30	8.50			
Digital Literacy	0–2	138	57.14	7.83	1.491	.217	.014
	3–5	86	58.12	7.69			
	6–9	65	56.12	6.99			
	10+	33	59.12	7.33			
Innovativeness	0–2	138	74.00	8.77	1.259	.289	.012
	3–5	86	75.13	8.39			
	6–9	65	74.40	10.99			
	10+	33	77.27	7.16			

Note. M = Mean; SD = Standard deviation; η^2 = Eta squared.

When Table 5 is examined, it was determined that teachers' proactive personality, digital literacy, and innovativeness scores did not differ significantly according to tenure at their current school ($p > .05$).

Table 6
One-Way ANOVA Results by School Level

Variable	Level	N	M	SD	F(3, 318)	p	η^2
Proactive Personality	Preschool	30	57.00	5.82	0.736	.531	.007
	Primary School	80	55.70	7.92			
	Middle School	97	55.20	7.70			
	High School	115	56.44	7.15			
Digital Literacy	Preschool	30	55.30	6.74	1.231	.298	.011
	Primary School	80	57.21	7.62			
	Middle School	97	57.25	7.32			
	High School	115	58.21	7.98			
Innovativeness	Preschool	30	75.93	7.13	1.314	.270	.012
	Primary School	80	76.03	9.77			
	Middle School	97	73.55	9.73			
	High School	115	74.48	8.26			

Note. M = Mean; SD = Standard deviation; η^2 = Eta squared.

When Table 6 is examined, it was determined that teachers' proactive personality, digital literacy, and innovativeness scores did not differ significantly according to the school level at which they work ($p > .05$).

Findings Regarding the Second Research Question

The findings regarding the second research question are presented below.

Table 7
Correlation Coefficients Among Variables

Variable	1	2	3
1.Proactive Personality	—		
2. Digital Literacy	.417**	—	
3. Innovativeness	.488**	.342**	—

Note. **$p < .01$.

When Table 7 is examined, it can be seen that there are positive and significant relationships between proactive personality and digital literacy ($r = .417$, $p < .01$), between proactive

personality and innovativeness ($r = .488$, $p < .01$), and between innovativeness and digital literacy ($r = .342$, $p < .01$).

Findings Regarding the Third Research Question

The findings regarding the third research question are presented below.

Table 8
Multiple Regression Analysis Results

Predictor	B	SE	β	t	p	Tolerance	VIF
Constant	27.152	3.522	—	7.709	< .001	—	—
Proactive Personality	.337	.059	.329	5.722	< .001	.762	1.313
Innovativeness	.152	.048	.181	3.157	.002	.762	1.313

Note. Dependent variable: Digital literacy. $F(2, 319) = 39.628$, $p < .001$. $R^2 = .199$. Durbin-Watson = 2.030. B = unstandardized coefficient; SE = standard error; β = standardized coefficient; VIF = variance inflation factor.

According to Table 8, the regression model is significant, $F(2, 319) = 39.628$, $p < .001$, and explains 19.9% of the variance in digital literacy, $R^2 = .199$. Proactive personality ($\beta = .329$, $p < .001$) and innovativeness ($\beta = .181$, $p = .002$) are significant predictors of digital literacy.

Findings Regarding the Fourth Research Question

The findings regarding the fourth research question are presented below.

Table 9
Mediation Analysis Results

Type of Effect	β	B	Boot SE	Boot LLCI	Boot ULCI
Total Effect (c)	.417	.428	—	—	—
Direct Effect (c')	.329	.337	.059	.221	.453
Indirect Effect (via Innovativeness)	.089	.091	.032	.032	.159

Note. LLCI = Lower limit confidence interval; ULCI = Upper limit confidence interval; Boot SE = Bootstrap standard error. The indirect effect is significant when the 95% confidence interval does not contain zero.

When Table 9 is examined, it can be seen that the total effect of proactive personality on digital literacy is significant, $\beta = .417$, $p < .001$. Bootstrap results show that innovativeness has a significant indirect effect, $\beta = .089$, 95% CI [.032, .159]. Accordingly, innovativeness plays a partial mediating role in the relationship between proactive personality and digital literacy.

Discussion

In this study, the relationships among teachers' proactive personality, innovativeness, and digital literacy were examined. In addition, the study investigated whether these variables differed according to various demographic characteristics, whether proactive personality and innovativeness predicted digital literacy, and whether innovativeness mediated the relationship between proactive personality and digital literacy. Overall, the findings indicated that teachers reported relatively high levels of proactive personality, innovativeness, and digital literacy. These variables did not differ significantly according to gender, age,

professional seniority, tenure at the current school, or school level. Furthermore, positive and significant relationships were found among the three variables. The findings also demonstrated that proactive personality and innovativeness were significant predictors of digital literacy and that innovativeness partially mediated the relationship between proactive personality and digital literacy.

The relatively high levels of teachers' proactive personality, digital literacy, and innovativeness suggest that teachers are generally willing to adapt to change, adopt new practices, and use digital technologies in their professional practice. This finding is consistent with Ertürk (2023), who reported high levels of proactive behavior and innovative work behavior among teachers. Similarly, Çapraz (2023) and Özkurt (2022) found that teachers demonstrated above-average levels of digital literacy and individual innovativeness. In contemporary educational settings, teachers are expected not only to apply their existing knowledge and skills but also to adapt to changing educational environments, keep pace with emerging technologies, and continuously improve their teaching practices. From this perspective, the present findings suggest that teachers possess the personal characteristics needed to meet these professional expectations.

No significant differences were found in teachers' proactive personality, innovativeness, or digital literacy according to gender, age, professional seniority, tenure at the current school, or school level. The absence of gender differences is consistent with the findings of Uygun (2023) and Ertürk (2023) regarding proactive personality, as well as those of Kılıç and Ayvaz Tuncel (2014) regarding innovativeness. Although previous studies have reported mixed findings regarding gender differences in digital literacy, Küslü (2022) and Gökbulut (2021) likewise found no significant differences. This finding suggests that teachers' engagement with digital technologies and their innovative tendencies are no longer strongly influenced by gender. Increased access to educational technologies and the widespread integration of digital tools into teaching may have contributed to reducing the gender-based differences reported in earlier studies.

A similar pattern was observed for age and professional seniority. The absence of significant differences across age groups supports the findings of Ertürk (2023). In contrast, Uygun (2023) reported that younger teachers demonstrated higher levels of proactive personality. Likewise, the findings regarding professional seniority are consistent with those reported by Ertürk (2023) and Kılıç and Ayvaz Tuncel (2014). The lack of significant differences in the present study may reflect the fact that digital transformation and innovation have become common professional expectations for teachers regardless of their years of experience. In addition, the widespread use of digital technologies in education and the increased availability of in-service professional development opportunities may have reduced differences across age and seniority groups.

No significant differences were found with respect to teachers' tenure at their current school. This finding differs from that of Ertürk (2023), who reported that proactive behavior and innovative work behavior increased with longer tenure at the same school. This discrepancy may reflect the influence of contextual factors such as school culture, leadership practices, and organizational climate. Likewise, no significant differences were found according to school level. This finding suggests that proactive personality, innovativeness, and digital literacy are not characteristics unique to a particular educational level. In contemporary educational settings, teachers at all levels, from preschool to secondary education, are expected to use digital technologies effectively, adopt innovative teaching practices, and

adapt to educational change. Therefore, it is not surprising that these characteristics were observed at similar levels across different school levels.

An important finding of the study is the positive and significant relationships among proactive personality, innovativeness, and digital literacy. The relationship between proactive personality and innovativeness is consistent with previous research. Pan et al. (2021), Siregar et al. (2026), and Ertürk (2023) identified proactive personality as an important antecedent of innovative behavior. According to Bateman and Crant (1993), proactive individuals actively seek to change their environment and are therefore more willing to adopt and implement new ideas. The present findings likewise suggest that teachers with stronger proactive personality traits are more open to innovative practices. Similarly, Aabbasian and Hassani (2025) reported that teachers' proactive personality significantly predicted their innovativeness. Likewise, Özdemir (2023) found that, based on teachers' perceptions, shared responsibility and proactive agility were strongly associated with innovation management ($r = .72$, $p < .01$) and significantly predicted innovation management ($\beta = .60$).

The positive relationship between innovativeness and digital literacy supports the findings of Özkurt (2022) and Ocak and Kuş Serin (2024). Individuals with stronger innovative tendencies are generally more willing to experiment with new practices and may therefore be more motivated to learn and use digital technologies. Rogers' (2003) Diffusion of Innovations Theory also emphasizes that individual characteristics play a key role in the adoption of innovations. From this perspective, innovativeness appears to strengthen teachers' willingness to adopt digital technologies and integrate them into their teaching practices.

The positive relationship between proactive personality and digital literacy is another important finding of the present study. This finding is consistent with Ozkan-Hidiroglu et al. (2021), who reported a positive relationship between technology literacy and proactive personality. Individuals with proactive personality traits are more likely to recognize opportunities, seek new knowledge, and adapt to changing conditions, all of which may contribute to the development of digital literacy. Likewise, the theoretical perspectives proposed by Crant (2000) and Parker et al. (2006) suggest that proactive individuals participate more actively in learning and professional development processes.

The regression analysis showed that proactive personality and innovativeness together explained approximately 20% of the variance in digital literacy. This finding suggests that digital literacy is influenced not only by technical knowledge and skills but also by individual characteristics and innovative tendencies. Explaining approximately one-fifth of the variance indicates that proactive personality and innovativeness are important psychological determinants of digital literacy. At the same time, the relatively modest proportion of explained variance highlights the multidimensional nature of digital literacy. Indeed, Ng (2012) and Falloon (2020) describe digital literacy as a complex construct that encompasses cognitive, technical, social, and pedagogical dimensions. Accordingly, other factors, such as self-efficacy, technological infrastructure, administrative support, professional development opportunities, and attitudes toward technology, are also likely to influence teachers' digital literacy.

The most notable finding of the study is that innovativeness partially mediated the relationship between proactive personality and digital literacy. The findings indicate that proactive personality influences digital literacy not only directly but also indirectly through innovativeness. In other words, teachers with stronger proactive personality traits are more

likely to develop an innovative orientation by actively seeking opportunities and leading change, which, in turn, contributes to higher levels of digital literacy. These findings suggest that proactive personality enhances digital literacy both directly and indirectly by fostering teachers' innovativeness. This highlights that the development of digital literacy depends not only on an individual's tendency to initiate change but also on the extent to which this tendency is translated into innovative behavior. As no previous study has directly examined this mediating mechanism, the present findings provide a novel contribution to the literature.

From a theoretical perspective, these findings are consistent with Rogers' (2003) emphasis on the role of individual characteristics in the adoption of innovations. Likewise, the findings of Pan et al. (2021) regarding the influence of proactive personality on innovative behavior and those of Bozbayındır and Alev (2018) concerning the relationship between proactive personality and openness to change support the proposed mechanism. However, the present study extends this literature by demonstrating that the relationship between proactive personality and digital literacy is explained not only by a direct effect but also through innovativeness. These findings suggest that digital literacy is associated not only with technical skills or access to technology but also with individuals' innovative tendencies. Accordingly, innovativeness can be regarded as an important psychological mechanism through which proactive personality contributes to the development of digital literacy.

Conclusion

Overall, the findings demonstrate significant and mutually reinforcing relationships among teachers' proactive personality, innovativeness, and digital literacy. In particular, the mediating role of innovativeness suggests that focusing exclusively on technical skills is insufficient to support teachers' digital transformation. Efforts to enhance teachers' digital literacy should also create learning environments that foster innovative thinking and proactive behavioral tendencies. Accordingly, in-service professional development programs should extend beyond technology training to include activities that promote innovative thinking, problem-solving, entrepreneurship, and change management skills. Such an approach may help teachers become not only effective users of technology but also active agents of educational change who bring innovation into their classrooms.

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

The authors declare that an AI-assisted language tool was used during the writing process of the article for the purposes of translating the text and correcting spelling/grammatical errors. This use was limited solely to language translation and the correction of spelling and grammatical errors.

References

Aabbasian, Z., & Hassani, M. (2025). The role of proactive personality in promoting innovative work behavior and creativity: A study of the mediation of intrinsic motivation and thriving at work in teachers. *School Administration, 13*(1), 83–95.

Agarwal, R., & Prasad, J. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research, 9*(2), 204–215. https://doi.org/10.1287/isre.9.2.204

Akın, A., & Arıcı Özcan, N. (2015). Short Turkish version of proactive scale: A study of validity and reliability. *Mevlana International Journal of Education, 5*(1), 165–172.

Bateman, T. S., & Crant, J. M. (1993). The proactive component of organizational behavior: A measure and correlates. *Journal of Organizational Behavior, 14*(2), 103–118. https://doi.org/10.1002/job.4030140202

Bozbayındır, F., & Alev, S. (2018). Öğretmenlerin öz yeterlilik, proaktif kişilik ve değişime açıklık algıları arasındaki ilişkinin incelenmesi [Examining the relationship between teachers' self-efficacy, proactive personality, and openness to change perceptions]. *İnönü Üniversitesi Eğitim Fakültesi Dergisi, 19*(2), 293–311. https://doi.org/10.17679/inuefd.346666

Büyüköztürk, Ş., Akgün, Ö. E., Demirel, F., Karadeniz, Ş., & Çakmak, E. K. (2015). *Bilimsel araştırma yöntemleri* [Scientific research methods].

Çapraz, Y. (2023). Okul müdürlerinin dijital liderlik davranışlarının öğretmenlerin dijital okuryazarlık yeterlilikleri ve bireysel yenilikçilik düzeyleri ile ilişkisi [The relationship between school principals' digital leadership behaviors and teachers' digital literacy competencies and individual innovativeness levels] (Thesis No. 805634) [Unpublished master's thesis, Eskişehir Osmangazi University].

Crant, J. M. (2000). Proactive behavior in organizations. *Journal of Management, 26*(3), 435–462. https://doi.org/10.1177/014920630002600304

Darling-Hammond, L. (2006). *Powerful teacher education: Lessons from exemplary programs*. Jossey-Bass.

Ertürk, R. (2023). Öğretmenlerin proaktif davranışları ile yenilikçi iş davranışları arasındaki ilişki [The relationship between teachers' proactive behaviors and innovative work behaviors]. *Bolu Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 23*(4), 2142–2159. https://doi.org/10.17240/aibuefd.2023..-1327252

Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia, 13*(1), 93–106.

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. *Educational Technology Research and Development, 68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth, D. (2020). *Preparing for life in a digital world: IEA International Computer and Information Literacy Study 2018 international report*. Springer. https://doi.org/10.1007/978-3-030-38781-5

Gilster, P. (1997). *Digital literacy*. Wiley.

Gökbulut, B. (2021). Öğretmenlerin dijital okuryazarlık düzeyleri ile hayat boyu öğrenme eğilimlerinin incelenmesi [Examining the relationship between teachers' digital literacy levels and lifelong learning tendencies]. *Yükseköğretim ve Bilim Dergisi, 11*(3), 469–479. https://doi.org/10.5961/jhes.2021.466

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Publications.

Hurt, H. T., Joseph, K., & Cook, C. D. (1977). Scales for the measurement of innovativeness. *Human Communication Research, 4*(1), 58–65. https://doi.org/10.1111/j.1468-2958.1977.tb00597.x

Kılıç, H., & Ayvaz Tuncel, Z. (2014). Sınıf öğretmenlerinin bireysel yenilikçilik düzeyleri ve yaşam boyu öğrenme eğilimleri arasındaki ilişki [The relationship between classroom teachers' individual innovativeness levels and lifelong learning tendencies]. *İlköğretim Online, 13*(2), 168–183.

Kılıçer, K., & Odabaşı, H. F. (2010). Bireysel yenilikçilik ölçeği (BYÖ): Türkçeye uyarlama, geçerlik ve güvenirlik çalışması [Individual Innovativeness Scale (IIS): Adaptation to Turkish, validity and reliability study]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 38*, 150–164.

Kukal, S., & Töre, E. (2024). Okul yöneticilerinin proaktif kişilik özellikleri ile teknoloji liderliği öz-yeterlikleri arasındaki ilişki [The relationship between school administrators' proactive personality traits and technology leadership self-efficacy]. *Kocaeli Üniversitesi Eğitim Dergisi, 7*(2), 481–512.

Küslü, F. (2022). Öğretmenlerin eleştirel dijital okuryazarlık becerilerinin çeşitli değişkenler açısından incelenmesi [Examining teachers' critical digital literacy skills in terms of various variables] [Unpublished doctoral dissertation, Anadolu University].

Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education, 59*(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016

Ocak, G., & Kuş Serin, B. (2024). Öğretmenlerin bireysel yenilikçilik ve dijital okuryazarlık düzeylerinin bilişim teknolojileri kullanım düzeylerini yordama gücü [The predictive power of teachers' individual innovativeness and digital literacy levels on their information technology usage levels]. *Anadolu Journal of Educational Sciences International, 14*(1), 147–169.

Özdemir, G. (2023). The relationship between school administrators' agile leadership and their innovation management competencies. *International Journal of Education & Literacy Studies, 11*(1), 175–184. https://doi.org/10.7575/aiac.ijels.v.11n.1p.175

Özden, M., Meydan, E., & Günay, G. (2024). Dijital okuryazarlık becerisi ölçeği: Güvenirlik ve geçerlik çalışması [Digital literacy skill scale: A reliability and validity study]. *Eğitimde Kuram ve Uygulama, 20*(1), 38–48.

Ozkan Hidiroglu, Y., Hidiroglu, C. N., & Tanriogen, A. (2021). The relationship between technology literacies and proactive personalities of secondary school mathematics teachers. *International Journal of Technology in Education and Science, 5*(1), 91–100.

Özkurt, L. (2022). Okul öncesi öğretmenlerinin dijital okuryazarlık ile bireysel yenilikçilik düzeyleri arasındaki ilişkinin incelenmesi [Examining the relationship between preschool teachers' digital literacy and individual innovativeness levels] (Thesis No. 725134) [Unpublished master's thesis, Hasan Kalyoncu University].

Pan, B., Song, Z., & Wang, X. (2021). The impact of proactive personality on innovative behavior among preschool teachers: The mediating role of self-efficacy. *Frontiers in Psychology, 12*, Article 734484. https://doi.org/10.3389/fpsyg.2021.734484

Parker, S. K., Williams, H. M., & Turner, N. (2006). Modeling the antecedents of proactive behavior at work. *Journal of Applied Psychology, 91*(3), 636–652. https://doi.org/10.1037/0021-9010.91.3.636

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Schleicher, A. (2018). *World class: How to build a 21st-century school system*. OECD Publishing.

Siregar, J., Widodo, W., Permana, R., Sriyono, H., & Saputro, A. (2026). Evoking teachers' innovative work behavior: Perspective of digital leadership, creativity, and proactive personality through work engagement. *European Journal of Educational Research, 15*(1), 323–339. https://doi.org/10.12973/eu-jer.15.1.323

Uygun, H. (2023). Öğretmenlerin proaktif kişilik özellikleri, mesleki doyumları ve psikolojik iyi oluş düzeyleri arasındaki ilişki [The relationship between teachers' proactive personality traits, job satisfaction, and psychological well-being levels] [Unpublished master's thesis, Dicle University].

Yi, M. Y., Jackson, J. D., Park, J. S., & Probst, J. C. (2006). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information & Management, 43*(3), 350–363. https://doi.org/10.1016/j.im.2005.08.006

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Inclusivity and Innovation at the "Istituto A. Olivetti per L'Innovazione" in Turin

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Abstract

This research examines the "Istituto A. Olivetti per l'Innovazione" in Turin as a significant case study in integrating inclusive education and technological innovation. Grounded in the Universal Design for Learning (UDL) framework, the educational model prioritizes small class sizes (max. 15 students) and instructional design tailored to diverse cognitive profiles. The study adopts a mixed-methods approach involving a sample of 45 students, including those with certified Specific Learning Disorders (SLDs), Special Educational Needs (SEN), and those at risk of social withdrawal or school phobia. The primary objective is to evaluate the impact of a textbook-free, e-learning environment and Artificial Intelligence (AI) tools on student inclusion and engagement. The methodology triangulates multiple data collection tools to ensure academic rigor: 1) Standardized testing: Using AMOS and QSA batteries to evaluate study strategies and SAS (School Anxiety Scale) to measure emotional impact; 2) Learning Analytics: Quantitative data extracted from the digital platform to monitor autonomous study patterns; 3) Qualitative analysis: Two focus groups with the teaching staff to assess pedagogical shifts. As an ongoing research project currently in its first year, this paper presents preliminary findings regarding the effectiveness of AI-enhanced practices in preventing marginalization. The study contributes to the international debate on educational technology by providing empirical evidence of how digital ecosystems can foster epistemic curiosity and provide essential skills for future academic paths.

Keywords: educational innovation, textbook-free pedagogy, AI in education, student-centered education

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Introduction

This paper is grounded in a necessary analysis of the contemporary Italian school system. It currently exhibits several critical issues, primarily related to overcrowded classrooms within the country's largest educational institutions. Data[1] indicate that numerous class groups do not comply with current safety regulations, while also representing a major driver of school dropout rates among students who require less crowded educational settings and a more personalized learning path.

While this process of adaptation remains systemically hindered for the reasons mentioned above, this cannot and must not serve as a justification for delaying necessary change at the micro-level. Small and medium-sized educational institutions—both public and state-accredited private (*paritarie*) schools—must critically evaluate their own practices and position themselves as pioneers for a long-overdue transformation.

The work of the Istituto "Adriano Olivetti per l'Innovazione," and consequently this study, is situated within this framework, representing the results of an investigation conducted within the institution during the 2025/2026 academic year. Given that this data analysis involves a sample of 45 students, this research does not claim to be exhaustive in any of the aspects examined; rather, it aims to demonstrate the value of an innovative educational approach implemented on a highly localized scale. This sample represents the initial step of an educational community that will hopefully grow in the coming years, gradually providing broader data without imposing an absolute vision of what it means "to do school."

An educational system that fails to remain adaptable to its core components—namely students, teachers, and families—fails to uphold its foundational principle.

To this end, this introduction first provides a brief contextualization of the establishment of the Istituto A. Olivetti, outlining the values and intentions behind its foundation as its inaugural academic year draws to a close. Secondly, it presents an overview of the defining features of the learning activities conducted both at school and at home: a textbook-free approach, the use of a digital learning platform, and the integration of AI tools throughout all educational activities.

The Istituto A. Olivetti per l'Innovazione is a state-accredited private upper secondary school founded with the intention of being a "different" school—without any presumption of being better than others, but with a firm conviction: the specific tool used to build the educational experience is secondary; what matters far more is how it is applied. Hence the decision to develop a textbook-free educational environment, replacing traditional paper textbooks with three integrated pillars. This does not imply that the print-based reading experience is completely discarded. Maryanne Wolf's (2009, 2018) research on "deep reading" has demonstrated that reading on paper remains fundamental for the development of critical thinking and the ability to identify key information within a text.

[1]The legal limits established by Presidential Decree No. 81/2009 (DPR 81/2009) set a cap of 27–30 students for first-year high school classes. According to data from the Single Portal of the Italian Ministry of Education and Merit (MIM), during the 2023/24 academic year, there were 12,593 classes with more than 25 students. Furthermore, these classrooms failed to comply with fire safety regulations regarding the mandated maximum occupancy and emergency outflow index (which limits capacity to 25 students plus the teacher).

The school offers two distinct tracks:

- Liceo delle Scienze Umane opzione economico-sociale (LES): a high school program based on human sciences and economics;
- Liceo Scientifico opzione scienze applicate (LSSA): a curriculum focused on IT subjects, mathematics, and physics.

First, within this textbook-free environment, our teachers are required to design their curriculum in strict alignment with the syllabi (*Programmazioni*) they draft for the current academic year. This allows them to adopt their preferred instructional materials while consistently prioritizing the adaptability of the educational activities carried out with students. Consequently, this approach emphasizes the educational path freely constructed by the teacher for their specific class, while simultaneously tailoring that path to the students' actual proficiency levels, eliminating the need to conform to the rigid structure of a pre-determined textbook. When designing the syllabus, teachers retain the autonomy to utilize whichever materials they deem most appropriate and effective, provided they can be shared digitally with the students.

Second, students have access to an asynchronous e-learning platform, which ensures that all topics covered in class are readily available—subject by subject and year by year—at any point during the school year. The decision to implement a platform to support and extend classroom instruction is fundamental for two primary reasons:

On the one hand, teacher-curated open-source materials flesh out the various topics within the syllabus, aiming to stimulate diverse learning styles that may not all be equally engaged by the varying teaching methodologies of individual instructors.

On the other hand, students who accumulate absences—whether due to health reasons or demanding competitive athletic careers during the school year—are guaranteed more comprehensive support to catch up on the material, moving far beyond the mere assignment of textbook pages to be studied independently at home.

Furthermore, each digital resource is paired with an activity that teachers can assign as homework or as an in-class assessment at the conclusion of a lesson. The adoption of a digital platform also enables the collection of data regarding student progress, academic performance, and satisfaction. The section following this introduction focuses precisely on these preliminary data, gathered both from the platform via end-of-unit quizzes across all subjects and through psychometric self-report questionnaires (AMOS, QSA, and SAS) administered to the students. Finally, in a cultural landscape where AI is increasingly ubiquitous—spanning from everyday contexts to specialized fields—it was deemed essential to incorporate its use into the curriculum, provided it could blend harmoniously with the rest of the aforementioned activities. This does not involve introducing AI as an isolated subject within the school curriculum, but rather integrating it as a study aid and a catalyst for individual curiosity, allowing teachers to approach various topics through an experimental, multifaceted lens. The final chapter, preceding the conclusions of this paper, will present a brief review of how several of our teachers operationalized this integration of AI within their daily teaching practice.

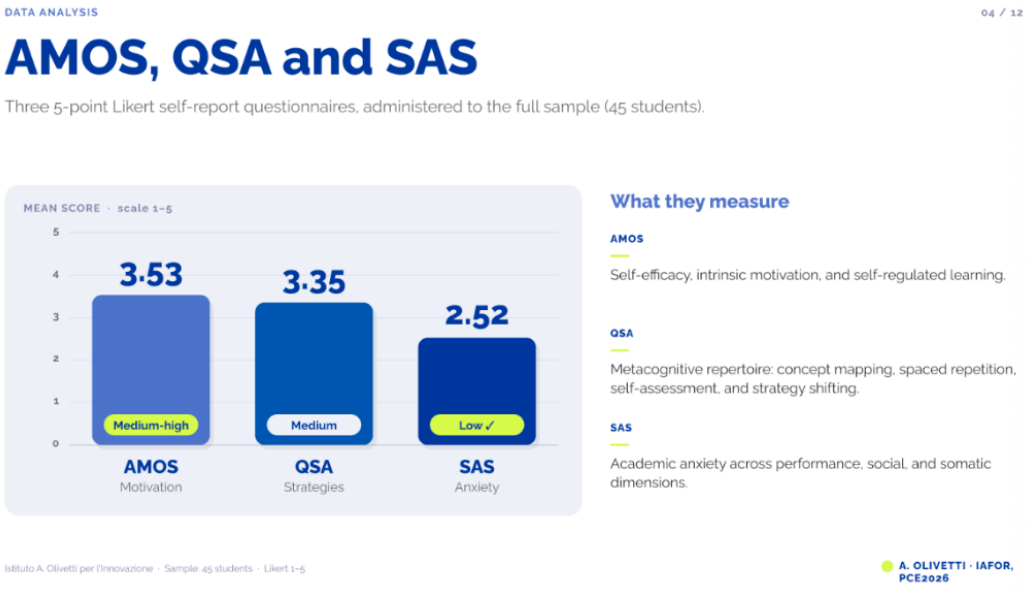
Data Analysis: AMOS, QSA, SAS, and Digital Assessments

The three self-report questionnaires utilized in this study are briefly described below. Each instrument consists of 15 items scored on a 5-point Likert scale:

- AMOS (*Abilità e Motivazione allo Studio* / Study Skills and Motivation): this instrument investigates students' perceived self-efficacy, intrinsic motivation, and self-regulated learning capabilities (such as planning, distraction management, and progress monitoring). Within the digital ecosystem of the Istituto Olivetti—where students autonomously navigate content on the e-learning platform—self-efficacy and motivational regulation emerge as critical predictors of educational success.
- QSA (*Questionario sulle Strategie di Apprendimento* / Learning Strategies Questionnaire): this questionnaire explores the student's metacognitive repertoire. This dimension develops through the use of concept mapping, spaced repetition, self-assessment, and strategy shifting when facing academic difficulties. In a textbook-free environment where resources are not pre-packaged but rather generated and curated via AI tools, the ability to select, organize, and monitor one's own strategies is particularly salient.
- SAS (School Anxiety Scale): this scale measures academic anxiety across three distinct dimensions: performance (exams and oral presentations), social (peer judgment and public speaking), and somatic (physical symptoms related to stress). The inclusion of the SAS is dictated by the composition of the sample, which includes students with SEN, learning disabilities, and individuals at risk of social withdrawal, for whom emotional well-being is a fundamental prerequisite for learning.

The questionnaires were administered to the students, and the resulting data underwent a triangulation process. This approach aimed to construct a multidimensional profile of the student, combining motivation (AMOS), strategic cognition (QSA), and the affective-emotional dimension (SAS) into a single cohesive framework.

Figure 1
Psychometric Questionnaires Scores



By examining the data analyzed from this initial research sample, several key insights can be observed.

The mean AMOS score, which ranges from medium to high, indicates that students demonstrate a strong willingness and predisposition to challenge themselves. Furthermore, it shows that they successfully achieve long-term memory retention of core concepts across most of the subjects studied.

The QSA data highlight that subjects where pure conceptual knowledge (acquired through traditional lecturing) intersected with teachers' efforts to anchor this knowledge to a more practical dimension yielded the highest performance scores in the digital assessments. A prime example of this can be seen in Philosophy and Computer Science, which approach this integration through completely different yet equally effective methodologies. Although our research is still in its preliminary stages, these findings demonstrate how "practical" or hands-on strategies significantly reinforce the consolidation of knowledge acquisition.

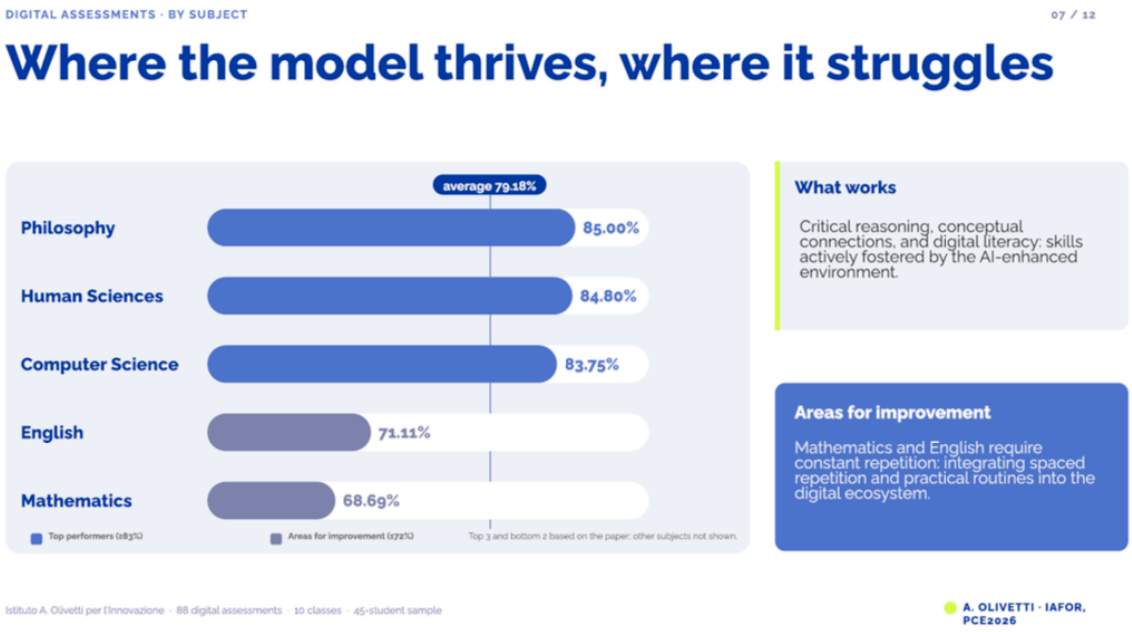
Conversely, the QSA questionnaire data—specifically the section concerning the time students dedicate to reviewing before a test—also reveal the most significant critical issues. These areas must be addressed to refine and enhance the educational environment. Indeed, the subjects that yielded the lowest scores in the digital assessments are precisely those requiring continuous, repetitive practice and exercise, such as Mathematics.

The scores derived from the SAS questionnaire proved to be the most successful, especially when aligned with one of the central, value-driven objectives of the Institute: combatting school dropout and social withdrawal. These metrics provide highly encouraging insights into the emotions experienced by students upon entering the school, revealing that students attend willingly and exhibit a very low rate of anxiety induced by the school environment itself.

Parallel to these psychometric questionnaires, a systematic assessment of conceptual and factual knowledge was conducted using 86 subject-specific quizzes termed "digital assessments." These tests were administered via the digital platform and involved the entire sample of 45 students distributed across 10 classes (representing the five-year high school cycle across two curricular tracks: LES and LSSA).

Figure 2

End-of-Unit Quizzes Results



The overall mean score stands at 79.18%—a result that, within the context of a completely textbook-free environment, can be considered remarkably positive. Over 55% of the quizzes (49 out of 86) exceed the 80% threshold, and 7 assessments fall within the excellence range (95–100%).The highest-performing subjects—Philosophy (85.00%), Human Sciences (84.80%), and Computer Science (83.75%)—share a common characteristic: they demand critical reasoning, conceptual connections, or digital literacy. These are precisely the skills that the AI-enhanced environment explicitly aims to foster. At the opposite end of the spectrum, Mathematics (68.69%) and English (71.11%) represent the primary areas for improvement, suggesting that disciplines with a strong procedural or linguistic component may require complementary pedagogical strategies within the digital ecosystem. Regarding the curricular tracks, the LES records a mean score of 80.38% compared to 76.79% for the LSSA ($\Delta = 3.59$ pp). This gap is more pronounced during the initial years and tends to narrow during the final three years, where the LSSA catches up with and occasionally surpasses the LES (e.g., 3rd-year LSSA: 81.85% vs. 3rd-year LES: 80.53%). The working hypothesis is that the curricular profile of the LES—which is more heavily oriented toward discursive and argumentative disciplines—adapts more readily to a quiz-based format. Conversely, the LSSA exhibits greater variability, showing peaks of excellence in STEM disciplines (e.g., 5th-year LSSA Computer Science: 97.50%) alongside more pronounced challenges in other areas.Through a comparative analysis of all the data collected and evaluated above, it is possible to map out a virtuous circle: positive quiz results generate higher motivation among students, which fosters greater commitment to studying, which in turn leads to enhanced academic performance.

The Integration of Artificial Intelligence in Classroom Practice

The inclusion of Artificial Intelligence (AI) tools within the classroom opens new horizons for pedagogical structuring and instructional design. While the specific modalities of utilizing AI vary across disciplines and instructors, a shared educational and operational framework persists: AI tools are invariably deployed to organize previously acquired ideas and concepts, never serving as a substitute for the fundamental phases of independent study and knowledge acquisition.

Grounded in this approach, educators at the Olivetti Institute experimented with classroom AI integration during this inaugural academic year. Three illustrative case studies from Natural Sciences, Italian Language and Literature, and Human Sciences are presented below. These examples aim to provide empirical insights into the efficacy of artificial intelligence integration when framed as a complementary asset rather than an exhaustive solution to all pedagogical needs within a healthy school environment.

Case Study 1: Environmental Requalification in Natural Sciences (5th-Year LSSA)

Artificial intelligence offers students the opportunity to operationalize their creativity through visual synthesis, bridging the gap between complex conceptual designs and their practical execution. This was demonstrated in a project conducted by the Natural Sciences instructor with fifth-year students in the Applied Sciences (LSSA) track.

Drawing from a real-world environmental news event, students designed a project focused on the environmental and social requalification of a polluted site. Each student assumed a distinct professional role within the class group, such as environmental engineer, air quality technician, or soil bioremediation specialist. The core objective was to formulate innovative

biotechnological solutions to restore the compromised environmental matrices and the site itself.

Once the structural proposal was finalized, students utilized AI tools to generate visual representations of the required equipment alongside a final rendering of the projected outcome. The project coordinator subsequently synthesized individual contributions into an innovative "Ecological Hub." Throughout the process, AI provided vital visual scaffolding across various project phases, enabling continuous monitoring. Guided by the final digital render, students ultimately constructed a physical scale model using exclusively recycled materials.

Case Study 2: Textual Typologies and Literary Recasting in Italian, History, and Geography (1st and 2nd Year)

Regarding the humanities curriculum, first-year students explored distinct textual typologies, focusing specifically on descriptive and expository texts.

Descriptive text exercises required students to use their own written descriptions to generate corresponding visual outputs—such as character identification cards, landscapes, or 3D models (via Meshy)—using generative AI platforms (Gemini, ChatGPT). Through this workflow, students engaged in foundational prompt engineering, concentrating heavily on lexical precision and spatial-temporal connectives.

Expository text exercises leveraged AI for presentation design. In this context, students used AI to deconstruct complex topics into smaller, digestible components, deferring content reformulation to a subsequent phase. This methodology exposed students to pre-structured informational hierarchies, allowing them to better grasp the logical connections between data—a core competency that required extensive practice throughout the year in both oral and written formats.

Furthermore, throughout the academic year, the instructor utilized AI to design practical workshops focused on alternative content creation, particularly to facilitate paraphrasing and deep comprehension of literary texts. Three workshops were implemented: two in the first-year class focused on the *Aeneid* and the *Odyssey*, and one in the second-year class centered on *The Betrothed* (*I Promessi Sposi*).

Grounded in the pedagogical objective of modernizing classical themes, each student group was assigned an excerpt from the literary work and tasked with recasting it into contemporary digital media formats tailored to the selected narrative episode. These formats included:

- WhatsApp group chats;
- True Crime podcasts;
- Double interviews;
- Reality show confessionals;
- Product reviews;
- "*Get Ready With Me*" (GRWM) video reels;
- Secret social media profiles and digital photo albums

Case Study 3: Stereotype Deconstruction in Civic Education

Within the Civic Education curriculum, AI was prompted to generate a series of educational flashcards based on stereotyped concepts, utilizing the mechanics of the game Taboo. The prohibited keywords consisted of superficial prejudices, and students frequently struggled to articulate statements without relying on those specific biased terms. This experiential activity successfully demonstrated to the students the superficial cognitive structures upon which social stereotypes are built.

Case Study 4: Theoretical Application in Human Sciences (3rd Year)

Finally, a notable methodology was adopted by the Human Sciences instructor with third-year students. At the conclusion of several lectures, the teacher prompted AI to generate specific case studies, subsequently requiring students to actively apply the sociological and psychological theories they were learning during class to these simulated real-world scenarios.

Conclusion and Future Perspectives

Based on the preliminary results outlined during this inaugural year, the development of this longitudinal research will continue into the next academic cycle, with the primary objective of implementing data-driven improvements to better support our students' learning outcomes.

Future phases of the study will maintain the qualitative and quantitative triangulation between psychometric questionnaires and digital end-of-unit assessments. Concurrently, we aim to expand the statistical analysis by broadening the sample size, thereby moving closer to the threshold required for full statistical validity.

Targeted pedagogical interventions will be crucial moving forward, particularly regarding the strengthening of spaced repetition techniques and student distraction management. To address these areas, architectural workflows are currently being developed to integrate structured spaced repetition features directly into the institutional e-learning platform. Furthermore, expanding data collection remains essential; therefore, subsequent layers of learning analytics—such as platform access frequency, active study time, and individual repetition patterns—will be integrated to build predictive models of student performance.

Ultimately, the educational, instructional, and experimental trajectory of this ongoing research must remain firmly anchored within the foundational values that inspired the creation of our institution: an educational environment that unyieldingly places the student and their unique individual characteristics at the absolute center of the learning process.

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

During the preparation of this manuscript, the authors used the generative AI tool Gemini (developed by Google) solely to assist in translating the original text from Italian into English and to refine the academic phrasing, grammar, and syntax. Following this process, the authors thoroughly reviewed, verified, and edited the resulting text. The authors maintain full responsibility for the originality, scientific accuracy, and overall integrity of the final work.

References

Wolf, M. (2007). *Proust and the squid: The story and science of the reading brain*. HarperCollins.

Wolf, M. (2018). *Reader, come home: The reading brain in a digital world*. HarperCollins.

Wolf, M., & Barzillai, M. (2009). The importance of deep reading. *Educational Leadership*, *66*(3), 32–37.

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AI-Driven EduFlipp Learning Model: Enhancing ESP for Undergraduates

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Abstract

This study investigates the impact of AI-supported tools on learner engagement, autonomy, and performance in English for Specific Purposes (ESP). Conducted with 50 Biomedical informatics bachelor's students at the University of Žilina, Slovakia, during the winter term 2024/25. The study compares two groups (n = 25 each) that used the same three AI-supported tools—Socrative (immediate feedback and formative assessment), Yoodli (AI-driven presentation feedback), and StudyFi (self-paced learning). Group B additionally followed the EduFlipp model (Flexible learning environment, Learner autonomy, Integrated AI tools, Practice orientation, and Personalisation), applying the tools within a structured flipped-classroom sequence of home-based preparation and in-class application, whereas Group A used the same three tools within a traditional, non-flipped ESP course structure. The study is grounded in the TPACK-AI (Technological Pedagogical Content Knowledge for Artificial Intelligence – focusing on how AI tools are meaningfully integrated into teaching) and MCC (Multimodal Communicative Competence – addressing verbal, non-verbal, and digital communication skills) frameworks, using a mixed-methods design. Quantitative data included pre-/post-tests, AI usage analytics, and structured questionnaires measuring tool usability, motivation, and communication confidence. Qualitative data from journals and interviews were thematically coded using NVivo. Post-intervention results confirmed all four hypotheses. Both groups showed statistically significant gains after using the three AI-supported tools ($p < .001$), with Yoodli producing the largest improvement in multimodal communicative performance ($d \approx 0.88–0.90$); Group B, which combined the tools with the full EduFlipp framework, achieved consistently larger effect sizes than Group A across all measured domains, alongside greater multimodal competence and improved motivation and self-regulation. The findings demonstrate that integrating AI within a student-centred FLIPP framework enhances ESP instruction through a sustainable, feedback-rich, and digitally responsive environment well-suited to preparing learners for 21st-century market needs.

Keywords: ESP, AI-supported tools, EduFlipp, TPACK-AI, MCC

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Introduction

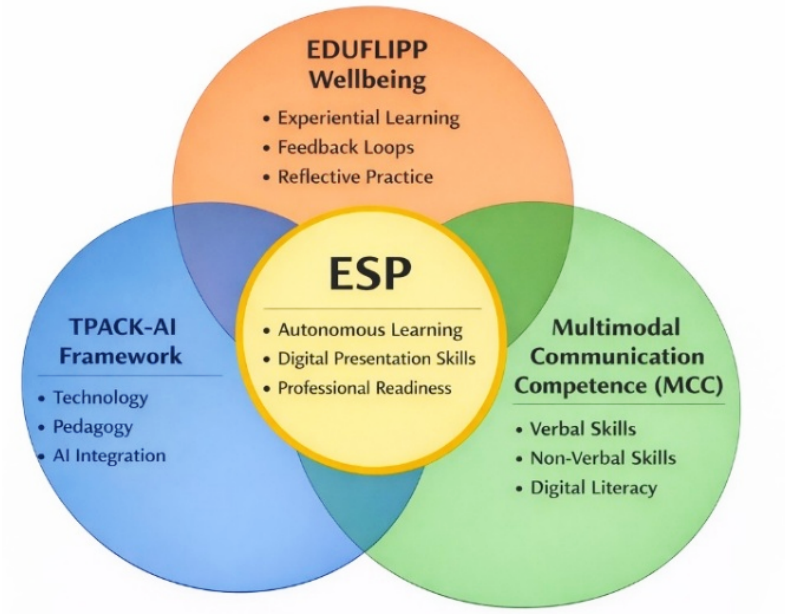
In today's digital era, the demand for professionals with strong English communication skills is growing, especially within English for Specific Purposes (ESP), where effective instruction combines linguistic competence with presentation skills, confidence, non-verbal communication, and digital literacy relevant to the workplace. At the same time, education increasingly promotes learner autonomy and self-regulated learning, encouraging students to take responsibility for their development both in class and independently, which supports motivation, communicative competence, and sustained engagement.

In response to these demand, AI-based applications have made ESP instruction more adaptive and learner-centred (Son et al., 2025). The use of AI tools can improve fluency, vocabulary, and learner engagement (Son et al., 2025). However, excessive reliance on AI may reduce interpersonal interaction, highlighting the need for teacher-guided integration.

Therefore, this study examines the development of communication skills in ESP through the guided use of three AI-supported tools—Yoodli, StudyFi, and Socrative—implemented in an undergraduate setting at the University of Žilina, Slovakia. Each tool targets a different aspect of professional communication training aligned with current ESP demands.

- **Yoodli** supports presentation competence by offering simulation-based feedback on fluency, pacing, filler words, and non-verbal delivery, thus fostering reflective and self-regulated improvement.
- **StudyFi** enhances autonomous learning through interactive study resources such as flashcards, mind maps, and podcasts, facilitating content retention and independent preparation.
- **Socrative** complements these tools by enabling real-time formative assessment, immediate feedback, and increased learner engagement through interactive classroom features, including the *Space Race* mode.

Figure 1
Integrative Frameworks EduFLIPP, TPACK-AI and MCC



Source: Authors

To assess the pedagogical value of these tools, the study employs the student-centered EduFLIPP approach grounded in TPACK-AI and the Multimodal Communicative Competence (MCC) framework. By examining professional communication development, the study aims to identify which tool most effectively supports autonomy, reflection, and multimodal competence while also contributing to students' motivation and well-being in language learning.

Literature Review

English for Specific Purposes and Artificial Intelligence

English for Specific Purposes (ESP) represents a specialised domain of language education focused on developing communicative competence required in specific professional and academic contexts (Dudley-Evans & St John, 1998; Hyland, 2006). Unlike General English, ESP prioritises authentic language use in discipline-oriented environments, with particular emphasis on discourse practices, pragmatic competence, and interactional strategies (Bhatia, 2004; Hyland, 2006). Communication in ESP is therefore not limited to linguistic accuracy but involves the ability to operate effectively within professional discourse communities.

The integration of AI into ESP language learning has transformed traditional approaches to technology- enhanced communication training. AI-based tools provide analytical, data-driven feedback and real-time evaluation of learners' verbal and non-verbal performance (Derakhshan et al., 2025; Ngo et al., 2024; Shadiev & Liu, 2023; Son et al., 2025; Wu et al., 2025). They deliver professional communicative competence using chatbots, speech analytics, and video feedback to enhance fluency and multimodal awareness.

Platforms such as Yoodli, StudyFi and Socrative exemplify this new generation of AI-supported systems designed to strengthen both linguistic and paralinguistic skills essential for professional success. For undergraduate students, communication skills include pronunciation, language accuracy, fluency, body language, and audience engagement—core ESP outcomes. These tools provide instant personalised feedback that enables learners to analyse, reflect, and adjust their performance in simulated or authentic professional settings.

Previous research indicates that AI systems can enhance personalised learning, learner agency, and communicative development when pedagogically guided (Deng et al., 2023; Holmes et al., 2019; Li et al., 2024; Luckin et al., 2016). Effective feedback, particularly when timely and specific, remains one of the strongest influences on learning outcomes (Hattie & Timperley, 2007). Nicol and Macfarlane-Dick (2006) emphasise that high-quality feedback fosters self-regulated learning and metacognitive awareness.

However, despite these technological advantages, language development remains fundamentally social. Contemporary research in AI and education similarly cautions that technology-mediated communication should complement rather than replace human interaction (Holmes et al., 2019). Pedagogically guided integration of AI is therefore essential to preserve authentic communicative practice while leveraging technological affordances.

EduFLIPP

Within this shift toward technology-enhanced and learner-centred communication training, flipped learning (here as EduFLIPP) emerges as a pedagogical model that integrates these

principles. In flipped instruction, learners engage with instructional content independently outside the classroom through digital resources, promoting self-regulated learning, planning, reflection, and progress monitoring (Bergmann & Sams, 2012).

Classroom time is then dedicated to interactive and communication-oriented activities such as discussions, professional simulations, teamwork, and problem-solving tasks (Bergmann & Sams, 2012; Bishop & Verleger, 2013). This structure enables learners to apply specialised language in authentic interaction and systematically develop professional communication skills.

Technological Pedagogical Content Knowledge – Artificial Intelligence

The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) provides a comprehensive model for evaluating technology use in educational contexts. By integrating technological, pedagogical, and content knowledge, TPACK enables systematic assessment of whether digital tools genuinely support communicative and disciplinary goals. The AI-oriented extension of the TPACK framework (TPACK-AI) is based on AI-specific dimensions, including algorithmic feedback, learner autonomy, and the ethical use of data. It analyses how technology (AI platforms), pedagogy (presentation training), and content (ESP communication) interact to enhance learning (Ning et al., 2024).

Multimodal Communication Competence

In this study, Multimodal Communication Competence (MCC) is used as a construct that complements TPACK-AI by evaluating multimodal communication across verbal, paralinguistic, and nonverbal dimensions, including eye contact, speech rhythm, intonation, facial expression, and gesture, informed by recent work on AI-supported multimodal language learning (Son et al., 2025). Integrating these constructs with the TPACK-AI dimensions (Ning et al., 2024) enables a holistic evaluation of how AI tools support performative aspects of ESP communication. By linking individual preparation (e.g., terminology development, pronunciation practice) with classroom-based professional dialogue, the EduFLIPP pedagogical model supports the development of MCC. Within this framework, the teacher acts as a facilitator of communication and mediator of technological support (Bergmann & Sams, 2012).

By integrating the EduFLIPP (Bergmann & Sams, 2012), TPACK-AI (Ning et al., 2024), MCC (Son et al., 2025) models, this study views AI tools not merely as technologies but as pedagogical partners that foster autonomous and reflective learning in ESP.

This approach is particularly relevant in university ESP settings, where learners must transition from academic English to discipline-specific professional communication, requiring both linguistic precision and confident delivery.

Finally, research suggests that flipped learning positively influences motivation and engagement (Zainuddin & Halili, 2016). When combined with AI tools, it creates a supportive environment that reduces communication anxiety and enhances learner confidence. The integration of gamification elements may further increase engagement and participation (Deterding et al., 2011).

Methodology

Research Design

The study used a mixed-methods design with 50 informatics students divided into two groups, Group A (n = 25) and Group B (n = 25), combining quantitative and qualitative approaches to assess both measurable outcomes and user perceptions. Both groups used the same three AI-supported tools (Yoodli, StudyFi, and Socrative); the groups differed in the pedagogical model within which the tools were embedded, as described below.

Group B (n = 25) followed the principles of FLIPP learning (Flexible learning environment, Learner autonomy, Integrated AI tools, Practice orientation and Personalisation) and was educated within the TPACK-AI and MCC frameworks, integrating and comparing the three selected AI tools within a structured flipped-classroom sequence of home-based preparation and in-class application. Group A (n = 25) used the same three AI-supported tools within a traditional, non-flipped ESP course structure, without the EduFlipp sequencing or explicit TPACK-AI/MCC-guided instructional design, which allowed the study to isolate the contribution of the EduFlipp pedagogical model beyond the tools themselves.

Participants

The study was conducted with 50 undergraduate students enrolled in the ESP course during the winter term 2024/2025 at the University of Žilina, Slovakia. All students had B2 level of English based on the Common European Framework of Reference (CEFR). Levene's test for equality of variances was used to assess the homogeneity of variance between the groups prior to the intervention, confirming their comparability at baseline.

Procedure

Group B (n = 25) implemented the three AI-supported tools (Yoodli, StudyFi, and Socrative) within the EduFlipp sequence, encouraging home-based preparation, in-class application, and active student participation, structured according to the TPACK-AI and MCC frameworks. Group A (n = 25) used the same three tools within a traditional ESP course structure, with continued focus on grammar, vocabulary, and language exercises, but without the flipped home-preparation/in-class sequencing used in Group B. Both groups voluntarily completed the SDT-aligned questionnaires to measure changes before and after the experiment.

Data Collection

A mixed methods approach was employed to gather both quantitative and qualitative data.

Quantitative data included pre- and post-tests, AI usage analytics, and SDT-aligned questionnaires.

Qualitative data from journals and interviews were thematically coded using NVivo.

Quantitative data included pre- and post-test communication scores using a 5-point rubric aligned with TPACK-AI categories (technological usability, pedagogical value, and communicative performance), tool-generated analytics: non-verbal indicators and student questionnaire responses on motivation, usability, and pedagogical alignment.

Qualitative data included observation checklists and teacher field notes, semi-structured interviews with learners and instructors and reflection journals documenting self-regulated learning and the use of feedback.

Data Analysis

Quantitative data were analysed using descriptive statistics, paired-samples *t*-tests, two-way ANOVA, Pearson correlation analysis, Cronbach's alpha for internal consistency, and Cohen's *d* to estimate effect sizes. Qualitative data were analysed through thematic coding in NVivo and aligned with the TPACK-AI and MCC dimensions. Triangulation ensured the reliability and validity of findings.

Research Objectives, Questions and Hypotheses

The study aims to explore which of the three AI-based tools—Yoodli, StudyFi or Socrative—is the most suitable for developing communication skills in ESP for undergraduate learners at the University of Žilina.

The primary objective was to determine which of the selected AI-based tools — Yoodli, StudyFi or Socrative — is the most suitable for developing verbal and non-verbal communication skills in English for Specific Purposes.

Table 1
Research Objectives, Questions, and Hypotheses

Objective (O)	Research Question (RQ)	Hypothesis (H)
O1. To evaluate the effectiveness of AI-based tools (Yoodli, StudyFi, Socrative) in developing verbal and non-verbal communication skills among undergraduates ESP learners.	RQ1. Which of the selected AI tools is most effective in improving ESP learners' verbal (fluency, accuracy, signposting) and non-verbal (eye contact, body language, voice modulation) communication skills?	H1. Yoodli will deliver the greatest overall improvement in multimodal communication thanks to its simulation-based and feedback-oriented design.
O2. To explore learners' and instructors' perceptions of the pedagogical and technological integration of AI tools within ESP communication training.	RQ2. How do learners and instructors perceive the pedagogical and technological fit of Yoodli, StudyFi, and Socrative in ESP communication training?	H2. Learners and instructors will perceive AI tools as pedagogically beneficial and technologically feasible when supported by reflective teacher mediation.
O3. To determine the impact of AI-supported feedback on learner autonomy, reflective practice and language performance?	RQ3. To what extent does AI-driven feedback enhance learner autonomy, self-reflection, and language performance quality?	H3. AI-driven feedback will significantly enhance learners' autonomy and reflective awareness, resulting in higher-quality language performance.

O4. To investigate the motivational and well-being effects of AI-enhanced communication training on ESP learners.	RQ4. How does the use of AI tools influence students' motivation, engagement, and well-being during ESP communication practice?	H4. AI-supported communication training will positively influence students' motivation, engagement, and sense of well-being by providing personal feedback.

Source: Processed by authors

Results

Based on the TPACK-AI model, the evaluation covered five key dimensions of the selected AI tools. **Technological fit** assessed each tool's functions, accessibility, user interface, and performance. **Pedagogical integration** focused on its relevance to ESP communication training. **Multimodal competence** evaluated the tools´ support for verbal and non-verbal skills and motivational impact. **Learner–teacher fit** dimension considered its use in class and independent study, including adaptability and required teacher support. Finally, **sustainability** evaluated its consistency and long-term use in ESP learning environments.

Table 2
Performance Analysis of AI-Based Tools Across TPACK-AI Dimensions

Steps	Yoodli	StudyFi	Socrative
Technological Fit	5	5	5
Pedagogical Integration	5	4	4
Multimodal Competence	5	5	3
Learner/Teacher Fit	5	4	4
Sustainability	5	4.5	4.4
Average Score	5.0 (Excellent)	4.5 (Very Good)	4.3 (Very Good)

Source: Processed by authors

Table 2 provides a comparative evaluation of Yoodli, StudyFi, and Socrative across five TPACK-AI dimensions: technological fit, pedagogical integration, multimodal competence, learner–teacher fit, and sustainability. Yoodli received the highest scores, achieving the maximum rating (5) in all categories. StudyFi showed consistently high results (4–5), with slightly lower scores in pedagogical integration and learner–teacher fit. Socrative obtained the lowest overall ratings (3–5), particularly in multimodal competence, while maintaining moderate scores in the remaining dimensions.

Conclusion:
Overall, Yoodli achieved the highest score, receiving 5 in all categories. This indicates excellent technological performance, pedagogical relevance, and support for communicative competence. It also showed high adaptability to classroom and independent learning and strong long-term sustainability.

Table 3
Results for Hypothesis 1 (H1) – Comparative Effectiveness of AI Tools Across Two Groups

Tool	Group (n = 50)	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Gain	t(24)	p	Effect Size (*d*)
Yoodli	A	3.80 (0.42)	4.48 (0.38)	+0.68	4.25	*.001*	0.88
	B	3.78 (0.44)	4.50 (0.36)	+0.72	4.39	< .001	0.90
StudyFi	A	3.79 (0.45)	4.40 (0.40)	+0.61	3.98	*.001*	0.82
	B	3.77 (0.46)	4.44 (0.37)	+0.67	4.11	*.001*	0.85
Socrative	A	3.73 (0.46)	4.40 (0.34)	+0.59	3.75	*.001*	0.80
	B	3.71 (0.47)	4.41 (0.35)	+0.64	3.82	*.001*	0.82

Note. A (n = 25 Informatics), B (n = 25 Informatics)
Two-way ANOVA (Tool × Group): $F(2, 96) = 5.21$, $p = .007$, $\eta^2 = .09$
Source: Processed by authors

Table 3 compares the statistical results presenting pre- and post-test performance across two learner groups (A and B) using three AI-based tools (Yoodli, StudyFi, and Socrative). The results show that all three tools led to statistically significant improvements ($p \leq .001$), with Yoodli showing the greatest mean gains (+0.68–0.72) and the largest effect sizes ($d \approx 0.88$–0.90). Moreover, a two-way ANOVA (Tool × Group) revealed a significant interaction effect ($F(2, 96) = 5.21$, $p = .007$, $\eta^2 = .09$), suggesting that tool effectiveness varied across groups.

Conclusion:
Hypothesis 1(H1) confirmed - Yoodli led to the most significant improvement in multimodal communicative performance.

Table 4
Results for Hypothesis 2 (H2) – Learner and Instructor Perceptions of AI Tools

Construct	Group (n = 50)	Mean (SD)	% Agree (≥ 4/5)	Cronbach's α	ANOVA F(2,96)	p
Pedagogical usefulness	A	4.56 (0.37)	95%	.90	2.91	*.042*
	B	4.52 (0.39)	94%	.89		
Technological feasibility	A	4.44 (0.40)	91%	.87	2.67	*.049*
	B	4.46 (0.38)	92%	.88		
Reflective teacher mediation	A	4.70 (0.34)	97%	.91	3.02	*.040*
	B	4.68 (0.35)	96%	.90		

Source: Processed by authors

Table 4 focuses on learner and instructor perceptions of AI tools across two groups. Both groups reported very high ratings for pedagogical usefulness, technological feasibility, and reflective teacher mediation, with mean scores above 4.4 and agreement levels exceeding 90%. Reliability was strong across all constructs, as indicated by Cronbach's α values above .85. ANOVA results showed statistically significant differences between constructs ($p < .05$), with reflective teacher mediation receiving the highest evaluation.

Conclusion:
Hypothesis 2(H2) confirmed – both groups rated the tools as highly useful and feasible. Teacher-mediated AI integration received the highest evaluation.

Table 5
Results for Hypothesis 3 (H3) – Learner Autonomy, Reflective Awareness, and Digital Design Quality (n = 50)

Variable	Group	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Gain	t(24)	p	Effect Size (d)
Learner autonomy	A	3.48 (0.50)	4.42 (0.45)	+0.94	5.22	< .001	1.10
	B	3.50 (0.52)	4.45 (0.43)	+0.95	5.36	< .001	1.12
Reflective awareness	A	3.55 (0.48)	4.36 (0.44)	+0.81	4.83	< .001	1.03
	B	3.54 (0.47)	4.40 (0.42)	+0.86	5.11	< .001	1.08
Digital presentation design	A	3.68 (0.44)	4.45 (0.36)	+0.77	4.52	< .001	0.96
	B	3.70 (0.43)	4.48 (0.35)	+0.78	4.60	< .001	0.98

Note. Correlation (feedback × design quality): $r = .52$, $p = .001$
Source: Processed by authors

Table 5 demonstrates the pre- and post-test results showing statistically significant improvements in learner autonomy, reflective awareness, and digital presentation design quality across both groups ($p < .001$). Learner autonomy showed the greatest gains (+0.94–0.95) with very large effect sizes ($d > 1.10$). It was followed by reflective awareness and digital presentation design quality, both also showing strong effects ($d \approx 0.96–1.08$), suggesting enhanced metacognitive engagement and multimodal competence in ESP tasks. The correlation coefficient (r) reflects the strength and direction of the relationship between feedback engagement and digital presentation design quality, showing a moderate positive association ($r = .52$, $p = .001$).

Conclusion:
Hypothesis 3 (H3) confirmed – AI-enhanced formative feedback in both groups significantly improved learner autonomy, reflection, and quality of digital communication.

Table 6
Results for Hypothesis 4 (H4) – Motivation, Engagement, and Well-being (n = 50)

Variable	Group	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Gain	t(24)	p	Effect Size (d)
Motivation	A	3.72 (0.46)	4.48 (0.38)	+0.76	4.65	< .001	0.98
	B	3.74 (0.45)	4.50 (0.36)	+0.76	4.73	< .001	1.00
Engagement	A	3.66 (0.50)	4.43 (0.40)	+0.77	4.58	< . 001	0.95
	B	3.68 (0.49)	4.46 (0.38)	+0.78	4.70	< .001	0.97
Well-being	A	3.58 (0.47)	4.38 (0.42)	+0.80	4.81	< .001	1.02
	B	3.60 (0.46)	4.40 (0.41)	+0.80	4.89	< .001	1.03

Source: Processed by authors

Table 6 demonstrates the pre- and post-test results indicating significant improvements ($p < .001$) across all affective dimensions — motivation, engagement, and well-being — in both groups. Large effect sizes ($d \approx 1.0$) confirm a substantial positive emotional-motivational impact of AI-supported ESP training.

Conclusion:
Hypothesis 4 (H4) confirmed – AI-enhanced communicative practice fosters higher motivation, engagement, and well-being, supporting learner-centred, confidence-building approaches in ESP education.

Table 7
Interpretation

Hypothesis	Focus	Corresponding Table	Result
H1	AI tools improve multimodal communicative performance	Table 3	Confirmed
H2	Positive learner and instructor perceptions of AI integration	Table 4	Confirmed
H3	AI feedback enhances autonomy, reflection, and design	Table 5	Confirmed
H4	AI use increases motivation, engagement, and well-being	Table 6	Confirmed

Source: Processed by authors

The findings from both groups of informatics students demonstrate that integrating AI-based tools (Yoodli, StudyFi, and Socrative) substantially improved multimodal communication competence. Yoodli showed the highest learning gains, confirming H1. Learners and instructors in both groups perceived the tools as pedagogically relevant and technologically feasible, supporting H2. Finally, AI-driven feedback fostered higher learner autonomy, reflective awareness, and digital design quality, strongly validating H3. Yoodli achieved the highest overall rating due to its immersive simulations, gamified feedback, and real-time analytics, which effectively develop fluency, pacing, and confidence. StudyFi demonstrated advanced multimodal analytics and strong support for verbal communication skills, while Socrative performed well in analysing clarity and professionalism, particularly for ESP domains.

AI Tools Adoption

Yoodli, as an AI speech coach, was selected for its strong pedagogical alignment with simulation-based learning principles. It allows learners to engage in realistic presentation or interview scenarios and receive immediate, gamified feedback on clarity, filler words, pacing, and confidence (Yoodli, n.d.). This interactivity mirrors the authentic communication demands emphasised in ESP and fosters self-regulated learning through AI-mediated reflection (Nicol & Macfarlane-Dick, 2006; Yoodli, n.d.).

StudyFi was included for its multimodal capabilities, which encompass spatial design tools (mind maps), brief interpretations (summaries), and interactive evaluation features (flashcards and tests). These functions enhance learner engagement and promote autonomy. This platform represents an intuitive and innovative learning tool suited for the demands of 21st-century education (StudyFi, n.d.).

This aligns with current CALL perspectives that emphasise multimodal competence, in which learners synthesise verbal, visual, and affective elements to communicate effectively in professional contexts (Son et al., 2025).

Socrative was selected for its adaptability to English for Specific Purposes (ESP) communication. Its use supports students' confidence in linguistic accuracy and facilitates the comprehension of complex professional contexts, which are essential in ESP instruction. Immediate feedback during the practice of specialised terminology further enhances learner engagement and satisfaction (Hattie & Timperley, 2007; Socrative, n.d.).

Additionally, the *Space Race* feature increases the tool's attractiveness by incorporating collaborative competition, which has been shown to foster motivation, well-being and active participation through gamified learning environments (Deterding et al., 2011; Socrative, 2018).

Tools Analyzed

Yoodli (yoodli.ai) is an AI speech coach that provides real-time analysis of communicative performance. It supports learners through role-play simulations of presentations, interviews, and academic talks, offering instant feedback on clarity, filler word usage, speech rate, and confidence. It helps users develop public-speaking fluency through gamified feedback and simulated audiences, which is essential for ESP students preparing for real-world communication scenarios (Yoodli, n.d.).

StudyFi (studyfi.com) is an AI-supported learning tool that facilitates self-regulated study through multimodal resources such as flashcards, podcasts, and visual mind maps. The platform generates structured topic summaries that can be used for review and preparation in ESP learning contexts. It creates flashcards that enable learners to practice content-related questions and answers, revise vocabulary and develop communicative confidence for professional interaction. In addition, the mind map feature provides a visual representation of key concepts, where learners can organise information and identify contextual interconnections within a given subject area. Overall, StudyFi offers digital support for content retention, autonomous preparation, and the development of communication skills in ESP learning environments (StudyFi, n.d.).

Socrative (socrative.com) is a digital tool that offers assessment and classroom response and is used to support formative evaluation and interactive learning activities. It enables instructors to create quizzes, polls, and short tasks that provide immediate feedback to learners. In ESP environments, Socrative can be applied to improve language accuracy, contextual understanding, and the acquisition of domain-specific vocabulary through structured practice and comprehension checks. The tool supports engagement through real-time participation and may assist instructors in monitoring learner progress. Socrative functions as an accessible platform for pedagogically guided language practice and classroom-based feedback integration that supports motivation and language confidence of learners (Socrative, n.d.).

Discussion of Findings

The results across all four hypotheses confirm the pedagogical, technological, and affective value of AI-enhanced communication training in ESP contexts.

Findings from the self-observation sheets and performance analysis (H1) indicate that learners have significantly improved both verbal and non-verbal multimodal competences, particularly in terms of fluency, clarity, and audience engagement. This supports the premise that simulation-based AI tools, such as Yoodli, can strengthen students' Multimodal

Communication Competence (MCC) through immediate, context-sensitive feedback and iterative practice.

From the TPACK-AI perspective, the study highlights a successful intersection of technological and pedagogical domains.

The perceptual data (H2) reveal that both learners and instructors perceived the tools as pedagogically applicable and technologically feasible, emphasising the importance of reflective teacher mediation in ensuring pedagogical coherence and learner trust in AI feedback. This synergy demonstrates that effective AI integration requires not only technical usability but also didactic intentionality.

In line with H3, post-test results confirmed substantial improvements in learner autonomy, reflective awareness, and digital presentation design quality. AI-driven feedback served as a metacognitive scaffold, enabling students to regulate their learning, self-assess their performance, and transfer skills across multiple modal contexts.

Finally, affective outcomes (H4) indicated strong benefits in terms of motivation, engagement, and well-being, supported by large effect sizes. These findings suggest that AI-enhanced communication training can foster learner agency and emotional resilience, thereby contributing to a positive and sustainable learning environment. Collectively, the results validate AI-assisted ESP training as a model that operates EduFLIPP, TPACK-AI and MCC frameworks to develop autonomous, confident, and digitally competent communicators.

The research objective — to compare AI tools for developing communication skills and assess their effectiveness in ESP contexts — has been successfully achieved through comparative analysis. The findings reveal that the selected tools collectively advance both verbal and non-verbal dimensions of communicative competence.

Yoodli stands out for its immersive role-play simulations, allowing ESP students to practice in realistic scenarios and receive direct AI feedback on intonation, pacing, and confidence.

StudyFi supports the development of self-regulated learning by facilitating contextual linkage and deeper cognitive processing, which enhances content retention and promotes more effective preparation.

Socrative is particularly effective in supporting language accuracy practice, strengthening learners' contextual comprehension, and reinforcing specialised terminology in ESP contexts, which are crucial for accurately delivering domain-specific content.

Together, these AI-driven tools encourage a data-informed approach to communication training, fostering self-reflection, autonomous learning, and professional readiness. Continuous software development will further enrich such training, contributing to the modernisation of ESP methodology.

Ethical Considerations and Limitations

The study followed the ethical standards of the University of Žilina. Participation was voluntary, informed consent was obtained from all participants, and all responses were anonymised and used solely for research purposes. Potential limitations include learner

variability and the novelty effect of the AI tools, which may have influenced initial engagement independently of the pedagogical model used.

Conclusion

The findings confirm that integrating AI tools such as Yoodli, StudyFi, and Socrative enhances multimodal communication competence, learner autonomy, and engagement in ESP contexts. Both learners and instructors perceived these tools as pedagogically beneficial and accessible, particularly when supported by reflective teacher mediation. The results highlight the potential of AI-assisted feedback to foster self-regulated, confident, and digitally literate learners.

The shift from traditional communication training to AI-enhanced analytics provides measurable insights, authentic practice, and adaptive feedback. Among the tools, Yoodli proved the most comprehensive, StudyFi offered strong analytical depth, and Socrative demonstrated contextual adaptability, together supporting fluency, confidence, and professional expression.

Overall, the study validates AI-enhanced communication training as a sustainable approach grounded in EDUFLIPP, TPACK-AI, and Multimodal Communication Competence frameworks. These tools represent a significant step in AI-enhanced CALL environments, positioning AI as a pedagogical partner in developing key 21st-century competencies. Future research should focus on classroom-based validation, longitudinal analysis, and the integration of multimodal feedback combining speech, gesture, and emotional analytics.

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

The authors declare that Grammarly, an AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. All AI-assisted content was reviewed and revised by the authors. AI tools were not used for data generation, analysis, or interpretation. Selected visual materials were generated using AI-based image generation tools.

References

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. International Society for Technology in Education.

Bhatia, V. K. (2004). *Worlds of written discourse: A genre-based view*. Continuum.

Bishop, J. L., & Verleger, M. A. (2013). The flipped classroom: A survey of the research. In *2013 ASEE Annual Conference & Exposition proceedings*. https://doi.org/10.18260/1-2--22585

Deng, X., Yu, Z., & Zhang, W. (2023). A meta-analysis and systematic review of the effect of chatbot technology use in education. *Sustainability, 15*(4), 2940. https://doi.org/10.3390/su15042940

Derakhshan, A., Teo, T., & Khazaie, S. (2025). Investigating the usefulness of artificial intelligence-driven robots in developing empathy for English for medical purposes communication: The role-play of Asian and African students. *Computers in Human Behavior, 162*, 108416. https://doi.org/10.1016/j.chb.2024.108416

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification." In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9–15). ACM. https://doi.org/10.1145/2181037.2181040

Dudley-Evans, T., & St John, M. J. (1998). *Developments in English for specific purposes: A multi-disciplinary approach*. Cambridge University Press.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112. https://doi.org/10.3102/003465430298487

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Hyland, K. (2006). *English for academic purposes: An advanced resource book*. Routledge.

Li, Y., Zhou, X., & Chiu, T. K. F. (2024). Systematics review on artificial intelligence chatbots and ChatGPT for language learning and research from self-determination theory (SDT): What are the roles of teachers? *Interactive Learning Environments, 33*(3), 1850–1864. https://doi.org/10.1080/10494820.2024.2400090

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Ngo, T. T.-N., Chen, H. H.-J., & Lai, K. K.-W. (2024). The effectiveness of automatic speech recognition in ESL/EFL pronunciation: A meta-analysis. *ReCALL, 36*(1), 4–21. https://doi.org/10.1017/S0958344023000113

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199–218. https://doi.org/10.1080/03075070600572090

Ning, Y., Zhang, C., Xu, B., Zhou, Y., & Wijaya, T. T. (2024). Teachers' AI-TPACK: Exploring the relationship between knowledge elements. *Sustainability, 16*(3), 978. https://doi.org/10.3390/su16030978

Shadiev, R., & Liu, J. (2023). Review of research on applications of speech recognition technology to assist language learning. *ReCALL, 35*(1), 74–88. https://doi.org/10.1017/S095834402200012X

Socrative. (n.d.). *Socrative*. https://www.socrative.com/

Socrative. (2018, October 18). *Space race vs. other classrooms and schools*. https://www.socrative.com/blog/space-race

Son, J.-B., Ružić, N. K., & Philpott, A. (2025). Artificial intelligence technologies and applications for language learning and teaching. *Journal of China Computer-Assisted Language Learning, 5*(1), 94–112. https://doi.org/10.1515/jccall-2023-0015

StudyFi. (n.d.). *StudyFi: AI app for students*. https://studyfi.com/en

Wu, T.-T., Hapsari, I. P., & Huang, Y.-M. (2025). Effects of incorporating AI chatbots into think–pair–share activities on EFL speaking anxiety, language enjoyment, and speaking performance. *Computer Assisted Language Learning*. Advance online publication. https://doi.org/10.1080/09588221.2025.2478271

Yoodli. (n.d.). *Yoodli: AI roleplays*. https://yoodli.ai/

Zainuddin, Z., & Halili, S. H. (2016). Flipped classroom research and trends from different fields of study. *The International Review of Research in Open and Distributed Learning, 17*(3), 313–340. https://doi.org/10.19173/irrodl.v17i3.2274

Quiet, Well-Behaved, Invisible: How Girls Experienced Primary School After Sexual Abuse by a Man From Within Their Family Ecosystem

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Abstract

Child sexual abuse is a global concern. However, recent national and international attention has focused on child sexual exploitation and sexual abuse which is technology assisted or that which happens between children, whereas a high proportion of victims and survivors were sexually abused as girls by men who were or felt like family. These victims are under-represented in research. Although primary school staff have ideal opportunities to support them, victims rarely disclose sexual abuse experiences at school. I led this research as an insider researcher using heuristic inquiry to provide insights into women survivors' experiences of primary school following sexual abuse by a man within their family ecosystem. Heuristic inquiry holistically investigates a social phenomenon for which the researcher and research partners share intense personal interest. Using a best-practice model with a trauma responsive and relational ethic of care, I invited women survivors to share memories and create meaning of what primary school was like for them. Twelve survivor research partners provided rich, nuanced details of how they experienced school, factors which were protective and what might have helped them disclose. Reflexive thematic analysis of the semi-structured interviews and follow-up communications revealed individual responses to trauma, how they masked what had happened to them, their efforts to establish autonomy and needs to matter in contrast with the sense of not mattering instilled by sexual abuse and familial responses. The awareness and recommendations generated will inform educators, practitioners in other sectors and policy makers to drive enhanced responses for victims.

Keywords: intrafamilial child sexual abuse, primary school, heuristic inquiry

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Introduction

This research investigated memories of primary school with women who were survivors of intrafamilial child sexual abuse. Intrafamilial child sexual abuse occurs in the child's family environment and is carried out by someone who is or feels like family (Gekoski et al., 2016). It is important to note that boys and young men are sexually abused, and that girls and women can be the abusers. However, I focused on survivors who were sexually abused as girls aged 12 or younger by men aged 18 or above. This population is under-represented in research (Horvath et al., 2014) and the Department for Education (DfE) (2025) guidance shared with education practitioners in the United Kingdom (UK). This paper sets out the aims of the research; how I explored different ways of knowing and discovering the essence of living experiences; decisions made to combine phenomenologically aligned and ethnographical methodologies and the choice of heuristic inquiry (Moustakas, 1990). I outline a trauma responsive and relational ethical approach for researching with women survivors and also include some examples of how I used autoethnography (Ellis, 2004) to reflect while researching and to illustrate reflexive practices. The first stage of findings is explained and themes are shared to inform practitioners in education and other agencies involved in child protection, to raise awareness of the living experiences of victims and promote an attitude of: 'it could happen here' (DfE, 2025, p. 17).

I explain autoethnography further in the Methods section but offer a brief outline here of the layout of the paper. The nature and findings of my research were presented at the conference through an autoethnographic layered account, as developed by Rambo Ronai (1995). I included changing perspectives from analytical to personal throughout the account and provided additional information in the form of reflective writings to show rather than tell (Ellis, 2004) about this aspect of my work. In this written record of the presentation, to signpost examples of this work and denote changes in voice from academic researcher to reflective practitioner I have italicised my creative writing to differentiate it from other quotes:

> *I sought to resolve imbalance,*
> *Embraced encounters connecting with others*
> *Approaching ceremony with decency, honesty,*
> *While the ancestors waited.*
> *I accepted sideways steps*
> *And unplanned routes,*
> *Told myself I was*
> *Open to the Universe's revealings*
> *With attempted cultural humility.*

While developing my research I considered what kind of knowledge we value and also how we know it. The style of research I chose reflects my belief that "truth" about anything varies depending on your perspective. I use the term "living experience" because the impact of child sexual abuse cannot be confined in the past, it continues throughout someone's lifetime (Breckenridge et al., 2024). During my studies, I was fortunate to be accepted to attend a summer internship at a LGBTQ+ project at the University of Toronto. There I explored indigenous, holistic world views as illustrated at the Indigenous Voices of Today: Knowledge, Trauma, Resilience exhibition (2023) at McCord Stewart Museum, Montreal. The exhibition modelled how knowledge is physically experienced, linked with emotion, thought and our spirit (or inner strength). It also showed how knowledge is tied to places that are important to us and to our spirituality or beliefs about the living things around us. This world view resonated

with my living experience (and trauma) and reflected my values. I consider myself an LGBTQ+ ally, anti-racist, anti-ableist and anti-sexist, and have worked hard in my 35-year teaching career to promote nuanced, equitable practice. My mother is descended from the La Trobe family. Although in my family history it is known that La Trobes worked to eradicate slavery alongside William Wilberforce, I am nonetheless embarrassed by their potential contribution to colonialism. Of course, I agree with feminism but I also believe marginalisation is complex and intersectional (hooks, 2015). In my work I have embraced a posthuman perspective which is compatible with the indigenous world view and which attempts to challenge colonialism, disrupt marginalisation and create inclusion without privileging any group of people and without privileging humans over other beings or the environment. Please see Braidotti (2023) for a better explanation of posthumanism than I have space for here.

Philosophy

I approached the research from a constructivist ontology because I acknowledge there are multiple realities relating to any individual experiences. This was extrapolated to an interpretive epistemology because I wished to determine essential meanings associated with living experiences with the people who shared those experiences. To best explore these essential meanings I felt that, as Denzin and Lincoln (2003) described, a combination of qualitative interpretive methods would secure "rigor, breadth, complexity, richness and depth" (Denzin & Lincoln, 2003, p. 5). While I also believed that by interpreting essential meanings with survivors of intrafamilial child sexual abuse from their memories of attending primary school, I could generate insight that would "make connections between lived experience, social injustices, larger social and cultural structures, and the here and now" (Denzin & Lincoln, 2018, p. 309). My research aim was to support practices that prevent the silence and silencing that still accompany child sexual abuse (Gekoski et al., 2016; Taggart & Wright, 2026), that disrupt abuse and enable children to begin to recover as soon as is possible.

Background to the Research

Child sexual abuse is considered a global problem by the United Nations Children's Fund (UNICEF) (2020) and World Health Organisation (WHO) (2017) with prevalence estimated to be in the region of 8% for boys and 20% for girls (WHO, 2017). In the UK, the English and Welsh government have commissioned a number of inquiries including the Independent Inquiry into Child Sexual Abuse (IICSA) which targeted institutional responses to child sexual abuse. The IICSA inquiry sought testimony from survivors, and of these, 5,862 participants gave consent for their data to be used. IICSA recognised globally acknowledged difficulties (UNICEF, 2020; WHO, 2017) in estimating prevalence of child sexual abuse because many victims do not talk to anyone about what has happened until much later, if at all (Jay et al., 2022; Manay & Collin-Vézina, 2021). IICSA reported prevalence drawn from Karsna and Kelly's (2021) estimates that in England and Wales 5% of boys and 15% of girls experience sexual abuse before the age of 16. The Children's Commissioner in England specifically investigated child sexual abuse in the family environment and found that two thirds of all child sexual abuse happened in and around the family home and that 75% of the victims were female (Longfield, 2015). Even though IICSA investigated institutional responses to child sexual abuse, 50% of the participants were sexually abused in their family environment (Jay et al., 2022). In relation to my research, it is also interesting to note that 79% of the IICSA participants were 11 years old or younger when first sexually abused. In spite of the higher proportion of children who are sexually abused within their family environment, the guidance for English and Welsh education practitioners (guidance for teachers and all other staff involved at schools

and colleges) (DfE, 2025) focusses on sexual activity between similarly aged children, child sexual exploitation and technology assisted sexual abuse.

My worry is that it is more palatable to focus on abusers who can be demonised, seen as different from us: as strangers or monsters. And I wanted to highlight the real experiences of hidden, ordinary girls sexually abused in their home environment, by family, neighbours and friends.

Ethical Approach

I adopted the "Survivors" Voices: Survivors Involvement in Research Ladder' best practice model (Chevous et al., 2023) from the point of applying to carry out this research. This approach advocates for research that is led by survivors who hold responsibility for decision-making, data-collection, analysis, recording, disseminating and evaluating the impact the research has had. The model (Sweeney et al., 2024, Vision) aims to "constructively disrupt[s] harmful institutional approaches" as well as to build "new approaches based on collective power." It is underpinned by trauma responsive practice which should "support healing processes and translate into lasting practice, policy and societal changes that serve survivors and prevent further trauma" (Sweeney et al., 2024, Vision). This is in line with the evidence based Handbook on Sensitive Practice for Health Care Practitioners produced by Schachter et al. (2009) and other resources produced globally (eg. Quadara and Hunter, 2016; SAMHSA, 2014). I was particularly keen to ensure ethical practices were ongoing throughout the research as described by Banks et al. (2013) and that the ethical approach was relational in line with Ellis' (2007) concerns for autoethnography. This approach was crucial to protect friendships and family members of all concerned with the research.

When I was thirty
I wanted them there
For proof that they cared?
And they didn't come.
I was a hurt wild thing
Wailing to the mountain.
Noone knew the darkness within.

Methods

In many ways my aspirations for the research aligned with phenomenology. I wished to gain understanding of how survivors interpreted the "meaning, structure, and essence" of their living experiences and to explore "how they perceive it, describe it, feel about it, judge it, remember it, make sense of it, and talk about it with others" (Patton, 2015, p. 115). However, I did not want to reduce the interpretation to an essence of the phenomenon itself, which would exclude the survivors from the final findings and I also felt that bracketing out my own experience would be counterproductive. I wanted to be authentic and honest with participants in line with trauma informed practice (Perôt et al., 2018; Quadara and Hunter, 2016; Schachter et al., 2009) and felt that my insider perspective was a valuable addition to the research.

Autoethnography

I planned the use of autoethnography to explore and represent epiphanies associated with my experience and the progress of the research. Denzin's description of an epiphany as "the sting

of childhood memory" (Denzin, 2014, p. 28) aptly described some of the epiphanies I had been having. Conceiving ways to illustrate snapshot moments in prose, poetry and painting proved an effective way of both processing and inciting epiphanies about my experiences: as I tried to represent them more memories were released. Autoethnography has the following aims outlined by Holman Jones et al.:

> Purposefully commenting on/critiquing of culture and cultural practices,
> Making contributions to existing research,
> Embracing vulnerability with purpose,
> Creating a reciprocal relationship with audiences in order to compel a response.
> (Holman Jones et al., 2013, p. 22)

These aims are delivered through three strands, where "auto" reflexively interrogates personal lived experience, "ethno" seeks understanding of a social phenomenon and "graphy" records the systematic analysis undertaken (Holman Jones et al., 2013). The researcher is expected to demonstrate vulnerability through accounts which show rather than tell about the experience and these accounts must deliver "verisimilitude" (Ellis, 2004) which Denzin (2014, p. 70) explained as "it evokes a feeling that the experience described is true, coherent, believable, and connects the reader to the writer's world."

> *It's little things that speak to you: something about a phrase*
> *That chimes, hooks a memory and draws it forth*
> *'In my head I can do anything.'*
> *I'm resignedly cross I didn't write that reference down.*
> *But from the prompt I felt myself soar.*
> *From the back of the garden, I'd lift off, clear the house and be gone.*

(I re-found the reference later in Katz et al., 2020, p. 5, speaking about dissociation).

My research was interrupted in 2024 for medical reasons when I suddenly found out I needed and was given a double heart bypass. Ischemic heart disease has been linked to childhood trauma (Felitti et al., 1998; Schachter et al., 2009). When I returned from my leave of absence, I came across the method of Heuristic Inquiry in Patton (2015). At this point, heuristic inquiry stood out to me and matched my aspirations for the research so well that I could not ignore it.

Heuristic Inquiry

Heuristic inquiry was conceptualised by Moustakas (Moustakas, 1990; Sultan, 2019). It is driven and reflexively informed throughout by a researcher's living experience of the phenomenon. It balances looking inwards with looking outwards and explores the essential nature of living experience with ten to fifteen co-researchers or research partners. Unlike in phenomenology, which reduces the essence of experience to a phenomenon and brackets out the individuals who experienced it: the individuals remain an important part of heuristic inquiry findings which generate "shared understanding of the core phenomenon, how it is sensed and experienced, and its significance to oneself, to others, and to the world" (Sultan, 2019, p. 9). I chose to use the heuristic inquiry method for the data collection part of the research because it seemed a natural fit for the relational approach to researching with survivors that I wanted to use.

Moustakas (1990) outlined six phases for heuristic inquiry which are: initial engagement, immersion, incubation, illumination, explication and creative synthesis. These are flexible and iterative and can progress in any direction, although the initial engagement, with a socially and globally significant research topic, must originate from personal experience that the researcher feels compelled to investigate. A learning mindset is then required to immersively explore it. Stepping back from immersion for a while, or incubation, enables subconscious growth and the development of tacit knowledge. While self-reflection and empathic dialogue with research partners enable new insight to emerge in moments of illumination (or epiphany). Meanings are explicated into reflexively explored and refined themes and are represented through individual then composite depictions which retain the essence of individuals' experiences. Finally, creative synthesis is required to portray overall interpretations (Moustakas, 1990; Sultan, 2019).

The practicalities of my project were that I initially attempted to recruit through a charity gatekeeper. Only one member of staff from the charity volunteered for the research but in the meantime, chance meetings and my engagement with wellbeing and survivor networks had generated an opportune, information rich sample (Patton, 2015). With updated university ethical approval, I was able to approach these additional contacts and overall twelve research partners contributed to the research. I invited survivors to engage with in-depth semi-structured interview conversations, through written feedback and with follow up meetings. These conversations were intentionally relational and reciprocal and included self-disclosure with the aim of achieving: congruence, through open, honest, authentic interaction; unconditional positive regard, by valuing and accepting individuals as they are; and empathy by seeking meaning from each other's perspectives (Rogers, 1980).

Telling a survivor they are safe may make them feel more at risk and watchful (Schachter et al., 2009). I attempted to enable the research partners to feel safe by showing them that they were in control of whether to and how to engage with the research; giving them clear accessible information; encouraging them to ask questions and take time to decide whether they wished to be involved in the research. I also tried to keep the tone of our (mostly emailed) conversations informal and kind. These measures were intended to counter experiences of betrayed trust and restricted autonomy inherent in child sexual abuse (Schachter et al., 2009; Sneddon et al., 2016).

Results

Relating to Literature

In many cases the research partners agreed with existing literature, including the UK independent inquiry final report (Jay et al., 2022) , for example, by giving similar reasons to the inquiry participants for why they were unable to tell anyone about their experiences (pseudonyms chosen by research partners):

> It wasn't safe to say anything really.
> You're naughty if you do, so … you shut down your real voice, don't you? (Becky)

> I wouldn't have been able to tell a teacher what had happened to me because I wouldn't have known, I'd have packed it away. (Hazel)

> I just used to think. Well, there's no point trying to fight my case or tell anybody, because they'll blame me. (Lara)
>
> I was told not to tell anybody else. Because nobody will believe you. So don't tell anybody else. (Isla)
>
> I was absolutely terrified of being cau[ght], found out … I do wonder if he would have killed me if he felt I'd betrayed him. (Jane)

The UK government guidance (DfE, 2025) signposts education practitioners to a UK child protection charity's (NSPCC, 2026) information on signs of sexual abuse, but research partners described few occasions when they felt they might have been noticeable in line with NSPCC guidance. These were as follows: one attempt at suicide, two experiences of enuresis, a few unusual patterns of eating and some whose physical appearance changed.

Essential Meanings

My main focus was to ask the research partners what they were like at primary school after they had been sexually abused. The following are the key points that were repeated throughout the interview transcriptions and written feedback shared by the research partners:

> Good, quiet, well-behaved, calm, polite, helpful, doing best, working really hard, never in trouble, people pleasing, perfectionist, timid, compliant, appeasing, shy, unheard, unseen, independent, avoiding attention, self-sufficient, introverted, lonely, afraid, waiting to be noticed, invisible, unable to ask for help, confused, withdrawn, anxious, not really present, hyper-vigilant, struggling to remember, struggling to concentrate, a misfit.

All of the research partners were deliberately hiding at primary school. They were trying to stay "under the radar" (Angela; Becky; Isla) or "not putting my head above the parapet" (Sarah). They wanted to be noticed but were desperately avoiding being noticed at the same time. Harriet summed it up perfectly. "It's kind of like how to be not seen, really, isn't it? (laugh) The lived experience of not being seen. Trying not to be seen" (Harriet).

In some cases, school was a safe space, a sanctuary, preferable to being at home, and it could be a place that provided hope and warmth. However, there were complex layers of fear: of being found out, of getting things wrong, of being bullied and of getting told off. Some of the survivors struggled with social situations. Some felt awkward, different, dirty, weird and disgusting. They internalised shame and some of the research partners developed a sense that their experiences were somehow their fault. The following table shows how key points which were repeated across the transcripts contributed to the themes drawn from the research:

Themes

Table 1
How Key Points From Transcripts Contributed to Theme

Key points from transcripts	Conceptual topics	Themes
Being good Being quiet Internalising impact Being independent Patterns of eating	Autonomy Control	How the survivors consciously or subconsciously attempted to assert some **autonomy** in their lives.
Escaping Body awareness Friendships	Being authentic self Invisibility Connection Freedom	How much they were able to identify and present as their **authentic selves**.
Early maturity Being noticed Friendships Being dismissed	Invisibility Being good enough Othering Mattering	How much they felt they **mattered** to the people around them.
Academic impact	Experiencing flow	Action points for school staff.

Although some of the research partners explained experiences of dissociation and/or hypervigilance, even small acts that enabled them to have autonomy supported their survival. The research partners were able to forget the trauma for a while through activities that enabled them to be authentic and that generated flow, for example through creative arts and writing, using imagination in play, reading, singing in harmony, through movement in dance, while running, swimming and in other sports. Achieving through self-determination in these areas was also supportive. And when the research partners experienced kindness and a sense that they mattered the impact of trauma was reduced. Many of them felt that if they experienced this sense of being nurtured at school, over time it could have built enough trust for them to talk about their experiences, if the right questions were asked.

To finish this report, I am sharing quotes from the research partners from the advice they would give to education practitioners. The first group answer the question:

What could teachers or staff at school have done?

> Be more aware of looking out for the quiet one, that is trying to not be noticed and seen. (Becky)
>
> I don't know if it's too young at primary school age, but I didn't know what was appropriate and what wasn't appropriate. (Laura)
>
> Education, school is a massive opportunity, should be a massive opportunity to really an holistic event … not even “added value” - an appalling phrase. It's that extra bit about being human. (Harriet)

> If only somebody had been brave enough to say well, you know? Knowing the right question to ask? (Lara)

> It would be good if teachers would look beyond the initial label they've got on a child. And think: is there something else going on? (Nina)

> A child … might talk about or frame it as a, like, this is a game. (Olivia)

And these are recommendations for practitioners:

> If there'd been a space, somewhere to go with these headaches or ~ upsets. That could have, in time, perhaps … if people had asked the right questions and framed it in the right way? (Jane)

> I would need a teacher to notice and I would have needed to have them build the safety and the trust with me. (Hazel)

> Curiosity in people that are offering children support … that would be great, wouldn't it? (Becky)

> Teachers in school could be those people, you know, somebody who notices you, somebody who checks in with you: How are you doing? … be that person who … looks happy to see you, who, you know, knows you? (Nina)

> I suppose school gave me hope, really, at one level, that stuff can be different … most of my teachers were nice people … it kind of gave me hope that, that there might be warmth in people. That warmth was possible … those are lifesaving qualities, really. (Harriet)

Conclusion

The choice of heuristic inquiry in this research facilitated rapport between researcher and research partners and helped to avoid power imbalances in the research relationships. Combining heuristic inquiry with autoethnography enabled the researcher's reflections to contribute to a layered account of the living experience of surviving intrafamilial child sexual abuse and show as well as tell about the impact of these experiences. These methodologies were enacted meticulously to determine nuanced meanings and generate thick description of the essence of experiencing primary school for girls that had been sexually abused by men who were or felt like family. These results were not designed to be generalisable but the transparency and accuracy with which they have been reported should enhance their credibility and trustworthiness.

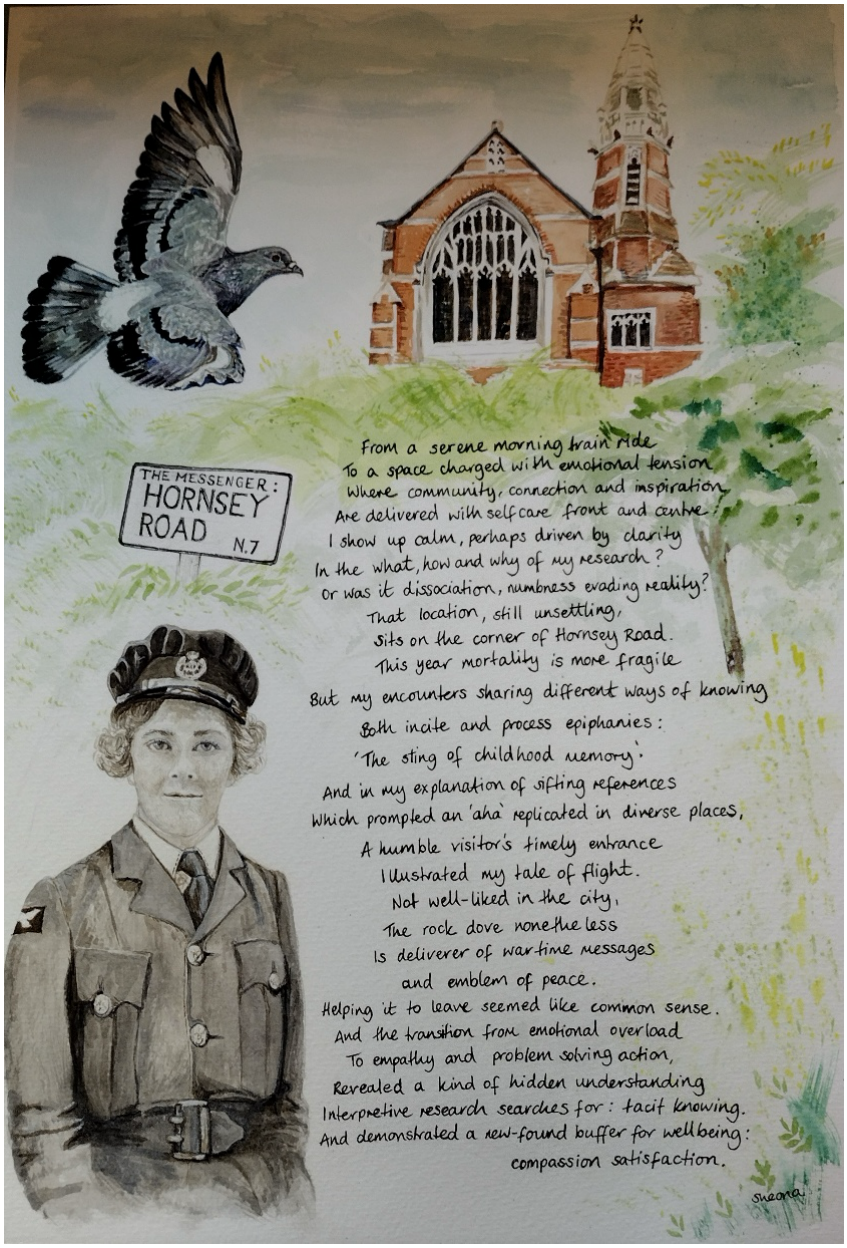
Twelve research partners from across England gave strikingly similar accounts of their school lives. They were all well-behaved and quiet. They had autonomy but they used it to actively hide what had happened to them. They began to thrive when they could express themselves authentically through physical and creative activities and they had desperate needs for connection and recognition consistent with mattering. The conditions constructed within trauma-informed schools which nurture all individuals could act to break down shame and rebuild trust for victims even if they remain hidden. School cultures which value individuals and encourage children to thrive as their authentic selves may reduce the impacts of

intrafamilial child sexual abuse and perhaps even create the conditions where victims are enabled to tell someone about it.

These results have been presented as a layered account (Rambo Ronai, 1995) in the hope that questions will linger to promote ongoing conversation and thus enhance the research's impact. I would like to finish with an example of illustrated reflective writing and a final quote to indicate that researching with survivors can be a positive experience. Sarah told me that since she began talking about her experience, she is living life in technicolour for the first time, she said, "I've been *existing* for 54 years of my life and now I'm beginning to *live*. In *technicolour*, rather than black and white" (Italics represent Sarah's emphasis).

Figure 1

Epiphany 4: The Messenger, 2025



Note. Number 4 in a series of illustrated pieces of reflective writing undertaken during research by Sheona Goodyear

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

The author declares that no AI or AI-assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Banks, S., Armstrong, A., Carter, K., Graham, H., Hayward, P., Henry, A., Holland, T., Holmes, C., Lee, A., McNulty, A., Moore, N., Nayling, N., Stokoe A., & Strachan, A. (2013). Everyday ethics in community-based participatory research. *Contemporary Social Science, 8*(3), 263 –277. https://doi.org/10.1080/21582041.2013.769618

Braidotti, R. (2023). Valedictory lecture: We are rooted but we flow. *Future Humanities, 1*(4), 1–12. https://doi.org/10.1002/fhu2.4

Breckenridge, J., Suchting, M., Hanna-Osborne, S., & Porteous, J. (2024). *Engaging with victims and survivors of child sexual abuse: A practice guide for workers and organisations*. prepared by the Gendered Violence Research Network and the National Association of Services Against Sexual Violence for the National Office for Child Safety, Canberra. https://www.childsafety.gov.au/resources/engaging-victims-and-survivors-child-sexual-abuse-practice-guide-workers-and-organisations-australian-government-initiative

Denzin, N. K. (2014). *Interpretive autoethnography*. 2nd Edn. Sage Publications Ltd.

Denzin, N. K., & Lincoln, Y. S. (2003). Introduction: The discipline and practice of qualitative research. In N. K. Denzin and Y. S. Lincoln (Eds.), *The landscape of qualitative research: Theories and issues.* 2nd Edn. (pp, 1–35). Sage Publications Ltd.

Denzin, N. K., & Lincoln, Y. S. (2018). Introduction: The discipline and practice of qualitative research. In N. K. Denzin and Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research.* 5th Edn. (pp. 1–26). Sage Publications Ltd.

Department for Education (DfE). (2025, September 1). *Keeping children safe in education*. https://assets.publishing.service.gov.uk/media/68add931969253904d155860/Keeping_children_safe_in_education_from_1_September_2025.pdf

Ellis, C. (2004). *The ethnographic I, a methodological novel about autoethnography*. Altamira Press.

Ellis, C. (2007). Telling secrets, revealing lives: Relational ethics in research with intimate others. *Qualitative Inquiry*, *13*(1), 3–29. https://doi.org/10.1177/1077800406294947

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine*, *14*(4), 245–258. https://doi.org/10.1016/S0749-3797(98)00017-8

Gekoski, A., Davidson, J. C., & Horvath, M. A. H. (2016). The prevalence, nature, and impact of intrafamilial child sexual abuse: findings from a rapid evidence assessment. *Journal of Criminological Research, Policy and Practice*, *2*(4), 231–243. https://doi.org/10.1108/JCRPP-05-2016-0008

Holman Jones, S., Adams, T. E., & Ellis, C. (2013). *Handbook of autoethnography*. Left Coast Press.

hooks, b. (2015). Writing without labels. *Appalachian Heritage*, *43*(4), 9–21.

Indigenous Voices of Today: Knowledge, Trauma, Resilience. (2023). [Exhibition]. McCord Stewart Museum, Montreal. 24 September 2021-permanent exhibition.

Jay, A., Evans, M., Frank, I., & Sharpling, D. (2022). *The report of the Independent Inquiry into Child Sexual Abuse*. https://www.iicsa.org.uk/reports-recommendations/publications/inquiry/final-report.html

Karsna, K., & Kelly, L. (2021, June). *The scale and nature of child sexual abuse: Review of evidence*. 3rd edn. Centre of expertise on child sexual abuse. https://www.csacentre.org.uk/documents/scale-nature-review-evidence-0621/

Katz, C., Tsur, N., Nicolet, R., Klebanov, B., & Carmel, N. (2020). No way to run or hide: Children's perceptions of their responses during intrafamilial child sexual abuse. *Child Abuse and Neglect, 106*, 104541–104552. https://doi.org/10.1016/j.chiabu.2020.104541

Longfield, A. (2015). *Protecting children from harm: A critical assessment of child sexual abuse in the family network in England and priorities for action*. https://www.childrenscommissioner.gov.uk/resource/protecting-children-from-harm/

Manay, N., & Collin-Vézina, D. (2021). Recipients of children's and adolescents' disclosures of childhood sexual abuse: a systematic review. Child Abuse and Neglect, *116*(1), 104–192. https://doi.org/10.1016/j.chiabu.2019.104192

Moustakas, C. (1990). *Heuristic research: Design, methodology and applications*. Sage Publications Ltd.

NSPCC. (2026). *Sexual abuse.* https://www.nspcc.org.uk/keeping-children-safe/types-of-abuse/child-sexual-abuse/

Patton, M. Q. (2015). *Qualitative research and evaluation methods*. 4th Edn. Sage Publications Ltd.

Quadara, A., & Hunter, C. (2016, October 26). *Principles of Trauma-informed approaches to child sexual abuse: A discussion paper. Sydney: Royal Commission into Institutional Responses to Child Sexual Abuse.* https://aifs.gov.au/research/commissioned-reports/principles-trauma-informed-approaches-child-sexual-abuse

Rambo Ronai, C. (1995). Multiple reflections of child sex abuse: An argument for a layered account. *Journal of Contemporary Ethnography*, *23*(4), 395–426.

Schachter, C.L., Stalker, C.A., Teram, E., Lasiuk, G.C., & Danilkewich, A. (2009). *Handbook on sensitive practice for health care practitioner: Lessons from adult survivors of childhood sexual abuse.* 2nd Edn. Public Health Agency of Canada.

Substance Abuse and Mental Health Services Administration (SAMHSA). (2014, July). *SAMHSA's concept of trauma and guidance for a trauma-informed approach*. https://www.nctsn.org/sites/default/files/resources/resource-guide/samhsa_trauma.pdf

Sultan, N. (2019). *Heuristic Inquiry, researching human experience holistically*. Sage Publications Ltd.

Sweeney, A., Fischer, L. E., Peeren, S., Wempe, M., Holderbach, S., Alyce, S., Chevous, J., Lovelock, C., Etwaria, R., Olson, S., & Craig, D. (2024, May 3). *Map of values.* https://www.survivorresearch.org/

Taggart, D., & Wright, K. (2026). Contagions of shame, dignity and connection: Working in the field of childhood sexual abuse. In D. Taggart and J. Stubley (Eds.), *Talking about non-recent child sexual abuse: Survivor, clinician and researcher perspectives.* (pp. 352-366) Routledge.

United Nations Children's Fund (UNICEF). (2020, December). *Action to End Child Sexual Abuse and Exploitation: A Review of the Evidence 2020*. https://www.unicef.org/media/89096/file/CSAE-Report-v2.pdf

World Health Organization (WHO). (2017, October 13). *Responding to children and adolescents who have been sexually abused*. https://www.who.int/publications/i/item/9789241550147

Classical Studies in Cyprus Education: Teaching Methodologies and Educational Directions

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Abstract

The teaching of Ancient Greek played historically a pivotal role in fostering a Greek identity in Cyprus and legitimizing the aspiration for the union of the island with the Greek state. To this end, it was modelled on that of Greece's secondary education. Despite independent statehood and the need to decouple Cypriot education policy from Greek curricula, notably after 1974, Cyprus have maintained its close connection with Greece regarding the teaching of the Ancient Greek language. We argue first that the diachronic adoption of teaching methods and textbooks from Greece has steered Cyprus towards a teacher-centered approach to Ancient Greek. We then argue that this is an unsuitable instructional approach in our times marked by an increasingly pressing need to cultivate students' higher-order thinking skills. The development of such skills is advocated not just by contemporary pedagogical practices or the European Union and international organizations. It is also recognised in the new national curricula of the two countries themselves. Finally, we argue that the teaching of Ancient Greek offers fertile ground for the cultivation of analytical, interpretative, synthetic, and evaluative skills and we conclude by proposing teaching strategies that enhance students' critical and creative thinking.

Keywords: Ancient Greek language teaching, Cyprus education, educational policy, higher-order thinking skills

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Introduction

The teaching of Ancient Greek in Cypriot secondary education was shaped by the island's particular historical circumstances, institutional structures, and ideological orientations, all of which influenced the formation of its educational policy. The civic-ethnic model of education adopted in Cyprus was grounded in the Greek curriculum of Humanities and Letters, placing particular emphasis on language, history, religion, and Ancient Greek (Koutselini, 1997). From the late nineteenth century onwards, the subject functioned not merely as a linguistic or philological discipline, but also as a key mechanism for the cultivation of Greek national consciousness among Greek Cypriots. Within this context, Cypriot educational policy developed in close alignment with the evolution of the Greek educational system, particularly with regard to curricula, textbooks, and teaching methodologies.

This close relationship proved especially significant in the field of Classical Studies. Ancient Greek was perceived as a means of safeguarding cultural continuity between antiquity and modern Hellenism, while its teaching reproduced, to a considerable extent, the pedagogical traditions prevailing in Greek secondary education. Consequently, the historical development of the subject in Cyprus cannot be understood independently of the broader political, ideological, and educational developments that characterised the Greek educational sphere.

The purpose of the present study is to investigate the historical trajectory of Ancient Greek teaching in Cyprus from the period of British colonial rule to contemporary educational reforms. Drawing on the theoretical framework of path dependency, the study examines how the long-term adoption of Greek curricula, textbooks, and pedagogical practices contributed to the formation of a powerful educational tradition that persisted despite the significant political, social, and educational transformations experienced by Cyprus throughout the twentieth and twenty-first centuries. In addition, the study analyses the reform initiatives of recent decades and the new educational priorities that have highlighted the need to reconsider the role of the subject. Finally, it argues that the teaching of Ancient Greek can move beyond its traditional grammar-translation orientation and function as a field for the development of students' critical and creative thinking, proposing indicative teaching strategies that respond to the demands of contemporary education.

Methodology

This study adopts a historical and qualitative approach. Drawing on educational policy documents, curriculum reports, official reform proposals, and relevant literature on the teaching of Ancient Greek in Cyprus, it examines the historical development of the subject from the colonial period to contemporary educational reforms. The analysis is informed by the theoretical framework of path dependency, which is used to interpret the persistence of educational structures, curricula, and pedagogical practices over time.

Particular attention is given to the ways in which educational policies, institutional arrangements, and ideological priorities shaped both the aims and the pedagogical orientation of Ancient Greek teaching. Through the examination of official reports, curriculum documents, and scholarly studies, the article traces the continuities and transformations that characterised the subject across different historical periods. Rather than focusing on isolated educational reforms, the analysis seeks to identify the broader historical processes that influenced the evolution of the subject and contributed to the formation of enduring educational traditions.

The study combines historical interpretation with contemporary educational analysis. While the first part explores the historical foundations of Ancient Greek teaching and the mechanisms that contributed to the reproduction of established practices, the second part examines recent reform initiatives and emerging educational priorities. In doing so, it investigates how contemporary developments in curriculum theory and Classical Studies pedagogy have created new possibilities for rethinking the role of Ancient Greek in secondary education, particularly with regard to the cultivation of students' critical and creative thinking skills.

The Historical Foundations of Ancient Greek Teaching in Cyprus

The institutionalisation of Greek education in Cyprus during the period of British colonial rule was closely associated with the national aspirations of the Greek-Cypriot community. Education was regarded as the principal means of preserving and strengthening Greek national identity, while Ancient Greek occupied a privileged position within the curriculum because of its symbolic role as a link to the classical past.

The educational model adopted in Greek-Cypriot schools was largely based on its Greek counterpart. Curricula, textbooks, examination systems, and pedagogical principles were transferred from Greece to Cyprus, creating a high degree of educational convergence between the two countries. Consequently, the teaching of Ancient Greek was shaped according to the methodological principles that already prevailed in Greek education, with particular emphasis on grammatical analysis, syntactical processing, and translation. These practices reflected the dominant educational assumptions of the nineteenth and early twentieth centuries, according to which the teaching of classical languages primarily aimed at cultivating intellectual discipline and linguistic precision. As a result, the interpretation of texts remained largely subordinate to their linguistic analysis (Persianis, 2006).

Path Dependency and Long-Term Educational Continuity

The persistence of specific teaching traditions can be interpreted through the theoretical framework of path dependency**.** According to this perspective, decisions made within a particular historical context generate institutional trajectories that tend to reproduce themselves and persist even after the original conditions that gave rise to them have changed (Mahoney, 2000; Pierson, 2000).

In the case of Cyprus, the adoption of the Greek educational model during the colonial period created a long-lasting form of institutional dependence. The use of Greek textbooks, the preparation of teachers according to Greek educational standards, and the maintenance of similar examination procedures reinforced the continuity of educational practices. The establishment of the Republic of Cyprus in 1960 did not lead to substantial changes in the teaching of Ancient Greek. Although political independence created the conditions for the development of an autonomous educational policy, the existing structures remained largely unchanged. Even after the events of 1974, when the need for an educational policy more closely aligned with the particular characteristics of Cypriot society became increasingly evident, the fundamental assumptions underpinning the teaching of the subject were largely preserved.

This continuity constitutes a characteristic example of path-dependent development. Established curricula, textbooks, examination requirements, and prevailing conceptions regarding the teaching of Ancient Greek functioned as mechanisms of institutional inertia,

limiting the possibilities for radical transformation and contributing to the long-term reproduction of traditional educational practice.

The Dominance of the Traditional Teaching Approach

Throughout the twentieth century, and well into the early decades of the twenty-first century, the teaching of Ancient Greek in Cyprus was characterised by the predominance of the grammar–translation method**.** Classroom instruction focused primarily on linguistic decoding, morphological and syntactical analysis, and the accurate translation of texts into Modern Greek. Within this framework, students were expected mainly to reproduce linguistic knowledge and predetermined interpretations. Teaching was organised around the teacher's presentation of content, reflecting a predominantly teacher-centred approach, while assessment rewarded accuracy and memorisation. Consequently, ancient authors were often approached more as sources of linguistic phenomena than as carriers of historical, political, or philosophical ideas (Markoglou, 2022).

This methodological tradition was further reinforced by the examination-oriented nature of the educational system. Success in examinations depended, and to a considerable extent still depends, on students' mastery of translation, grammar, and syntax. As a result, teachers frequently prioritised content coverage and linguistic accuracy at the expense of inquiry-based and interpretative approaches.

The close alignment of Cypriot education with Greek curricula and textbooks inevitably influenced the teaching of Ancient Greek. However, educational policies and pedagogical choices developed within a different social and educational context were not always adapted to the specific needs of the Cypriot school system. At the same time, from the final decades of the twentieth century onwards, both Greek and international scholarship increasingly questioned the effectiveness of dominant approaches to Classical Languages teaching. Criticism focused on the excessive emphasis placed on grammatical processing and the reproduction of predetermined interpretations, practices that often limited students' opportunities to engage with ancient texts as sources of cultural meaning and historical inquiry (Kakridis, 2010; Tsafos, 2004; Varmazis, 2008; Zekas, 2018).

Within this context, contemporary developments in Classical Languages pedagogy began to place greater emphasis on connecting linguistic instruction with the historical and cultural context of texts, as well as on promoting students' active participation in the interpretative process (Markoglou, 2026). These developments gradually highlighted the need to reconsider the teaching of Ancient Greek in Cyprus, not in terms of its place within the curriculum, but rather in terms of its educational aims and pedagogical practices. As Cypriot education became increasingly oriented towards European educational priorities from the 1990s onwards, the modernisation of Ancient Greek teaching became closely linked to broader discussions concerning curriculum renewal and the transformation of school knowledge.

Despite international and European developments promoting more student-centred approaches and the cultivation of higher-order thinking skills (European Commission, 2018; OECD, 2019), the teaching of Ancient Greek in Cypriot secondary education has continued to be characterised, to a considerable extent, by teacher-centred practices and a strong emphasis on linguistic analysis (Markoglou, 2022, 2026). The persistence of this educational tradition can be attributed to several interrelated factors.

First, it reflects the long-standing attachment to the Attic model of instruction and the grammar–translation tradition that dominated both Greek and Cypriot education for much of the twentieth century (Kakridis, 1994; Kazazis, 2001; Koutselini & Agathangelou, 2010; Makris, 2000). Second, a number of studies have highlighted the insufficient pedagogical and didactic preparation of both pre-service and in-service teachers regarding contemporary approaches to the teaching of Classical Languages (Bista et al., 2016; Frydaki, 2015; Kassotakis, 2010; Kazamias et al., 1996). Third, many educators continue to believe that a strong focus on grammar, syntax, and translation prepares students more effectively for high-stakes examinations (Tsiortas, 2008; Varmazis, 2008).

The prevalence of these assumptions contributed to the maintenance of a relatively stable teaching culture, even during periods in which educational policy attempted to introduce new pedagogical orientations. As a result, the transition towards more inquiry-based, interpretative, and student-centred forms of teaching occurred at a relatively slow pace. This helps explain why the demand for a substantial renewal of Ancient Greek teaching has re-emerged with particular intensity during the educational reforms of recent decades.

Contemporary Educational Reforms and New Priorities

During recent decades, international developments in education have increasingly highlighted the need to cultivate higher-order skills, including critical thinking, creativity, problem-solving, and collaboration (European Commission, 2018; OECD, 2019). This shift reflects broader social and economic transformations associated with globalisation, the knowledge society, and the growing need to prepare students for complex and rapidly changing environments. Consequently, educational policy across many European countries gradually moved away from an exclusive emphasis on the accumulation of knowledge and towards the development of competencies that enable students to analyse information, evaluate evidence, construct arguments, and formulate well-reasoned judgments.

These developments also influenced Cyprus, where, from the early 2000s onwards, an increasingly intense debate emerged concerning the orientation and effectiveness of the educational system. A major turning point was the establishment of the Educational Reform Committee in 2003, which was tasked with examining the Cypriot educational system as a whole and proposing directions for its modernisation. For the first time since independence, educational policy sought to be grounded in a systematic analysis of the social, cultural, and economic conditions of the Republic of Cyprus rather than relying exclusively on the transfer of educational models from Greece.

The Educational Reform Committee's report (2004) linked educational modernisation to a broader reconsideration of the aims of schooling, emphasising the development of democratic attitudes, critical thinking, creativity, and students' active participation in the learning process. These ideas influenced subsequent reform initiatives and were reflected in the new curricula, which placed greater emphasis on student-centred learning, inquiry-based forms of instruction, and the development of key competencies and skills (Persianis, 2006, pp. 199–200).

These developments inevitably influenced discussions concerning the role and orientation of Ancient Greek within the Cypriot school system. Whereas in previous decades the subject had been valued primarily for its contribution to the preservation of Greek cultural continuity and national identity, it gradually came to be viewed as a discipline capable of contributing to the development of cognitive, metacognitive, and interpretative skills. This shift was reinforced by

contemporary trends in Classical Languages pedagogy, which advocated a closer integration of linguistic instruction with the historical and cultural contexts of texts, as well as a more active role for students in the interpretative process.

Despite these emerging priorities, the trajectory of the subject was not characterised by a radical departure from established teaching practices. Rather, reform initiatives coexisted with strong historical continuities that continued to connect the subject to the traditional approaches prevailing in Greece. A characteristic example is the recommendation of the Committee for the Reform of the Curriculum (MoEC, 2015, pp. 3, 22) to strengthen the position of Ancient Greek and Classical Studies. This recommendation was based both on the cultural and historical significance of the subject and on its potential contribution to the broader intellectual development of students. Nevertheless, as was also the case in Greece, modernisation efforts encountered deeply rooted institutional and pedagogical traditions that had been established during earlier periods.

This tension between reform-oriented discourse and educational continuity became one of the defining characteristics of the contemporary period and shaped the framework within which new proposals for the teaching of Ancient Greek emerged. Within this context, the central debate gradually shifted from the question of whether the subject should be preserved to the question of how it should be taught and how it could contribute to the development of students' critical and creative thinking skills.

Repositioning the Role of Ancient Greek

Contemporary approaches to Classical Studies challenge the traditional perception of Ancient Greek as exclusively a language-based subject. Instead, they highlight its potential contribution to the development of higher-order cognitive skills and to students' active engagement with the meanings embedded in ancient texts. Within this framework, the focus shifts from mechanical linguistic processing towards interpretation, historical understanding, dialogue, and the critical examination of sources.

This shift is associated with a broader reconsideration of the aims of Ancient Greek teaching. Ancient texts are no longer approached solely as objects of translation and grammatical analysis, but also as historical, cultural, and ideological documents that can serve as starting points for inquiry, reflection, and the construction of meaning. Although translation remains an important component of instruction, it is no longer treated as an end in itself; rather, it is integrated into a wider process of understanding, interpretation, and evaluation.

At the same time, connecting ancient texts with their historical and cultural contexts, together with the use of diverse extratextual sources, expands the educational potential of the subject and strengthens the links between past and present. From this perspective, Classical Studies can contribute not only to students' linguistic and cultural formation, but also to the development of competencies considered essential for contemporary education and democratic participation.

In light of these developments, there is an increasing need to adopt teaching approaches that move beyond the grammar–translation tradition and make full use of the educational potential of ancient texts for the cultivation of critical and creative thinking. The following section presents a number of indicative teaching strategies that illustrate how these contemporary

pedagogical orientations can be implemented in the teaching of Ancient Greek in secondary education.

Cultivating Higher-Order Thinking Skills in Ancient Greek

Building on the historical and theoretical framework outlined above, this article proposes a series of teaching strategies inspired by the principles of critical pedagogy, aiming to cultivate students' higher-order thinking skills through the teaching of Ancient Greek. More specifically, it encourages educators to adopt practices that foster critical and creative thinking within the context of Cypriot secondary education. Critical pedagogy was selected as a guiding framework because it seeks to create conditions that support students' intellectual, cultural, and personal development. In this perspective, learning is not limited to the transmission of predetermined knowledge; rather, it actively engages learners in constructing meanings, interpretations, judgments, and generalisations (Bertrand, 2003). Such an approach contributes to the development of higher-order cognitive, metacognitive, and socio-emotional competencies (Anderson & Krathwohl, 2001; Krathwohl et al., 1964).

The shift of contemporary curricula towards the development of higher-order thinking skills has created new possibilities for the teaching of Ancient Greek. In particular, critical thinking can be cultivated through activities that encourage students to interpret, analyse, evaluate, and synthesise information, moving beyond the mechanical processing of linguistic forms. The comparative examination of historical and literary sources, the exploration of multiple perspectives, the evaluation of arguments, and the justification of personal positions transform ancient texts into spaces of dialogue, inquiry, and reflection. Likewise, teaching techniques such as debates, the evaluation of historical claims, the analysis of ideological dimensions of texts, and the formulation of alternative interpretations contribute to the development of analysis, evaluation, argumentation, and reflective judgment. From this perspective, Ancient Greek should not be viewed merely as a subject of linguistic training, but as a privileged educational field for cultivating critical thinking and active citizenship, in line with contemporary conceptions of classical education and democratic literacy (European Commission, 2018; Facione, 2009; Markoglou, 2026).

Beyond critical thinking, Ancient Greek also offers significant opportunities for the cultivation of creative thinking. Ancient texts can serve as starting points for the generation of new ideas, alternative interpretations, and original narratives. Techniques such as SCAMPER, hypothetical scenarios ("What would happen if...?"), perspective shifts, narrative reconstruction, creative writing, dramatization, and digital storytelling encourage students to move beyond conventional readings and engage with the ancient world through imagination and originality. Through activities such as designing alternative endings, reconstructing dialogues, creating new narratives based on ancient characters, or transferring events to different historical and social contexts, learners are encouraged to generate ideas, combine diverse elements, and develop divergent thinking. In this way, the teaching of Ancient Greek can evolve from a process of knowledge reproduction into a process of creative meaning-making, enabling students to construct personal and collective interpretations of the ancient world while fostering innovation, imagination, and intellectual autonomy (Beghetto & Kaufman, 2014; Runco & Jaeger, 2012).

Conclusions

The historical trajectory of the teaching of Ancient Greek in Cyprus highlights the decisive role played by broader political, social and ideological conditions in shaping the subject. From the period of British rule up to the first decades of the twenty-first century, Ancient Greek was closely associated with the formation of Greek national identity and the preservation of the cultural continuity of Hellenism. The long-term adoption of Greek curricula, school textbooks and teaching practices created a strong educational tradition, which was maintained even after the independence of the Republic of Cyprus and the significant socio-political changes that followed. This development confirms that educational policies and teaching practices are not shaped exclusively by contemporary reform initiatives, but are substantially influenced by previous choices and institutional trajectories that tend to reproduce themselves over time.

The analysis also showed that the dominance of the grammar-translation tradition and teacher-centred forms of instruction constituted one of the most stable characteristics of the subject in Cypriot secondary education. Despite the modernisation efforts that emerged from the 1990s onwards, as well as the increasing influence of European educational policies, changes in the field of Ancient Greek often remained limited and fragmented. Nevertheless, contemporary reform directions gradually highlighted the need to redefine the role of the subject, not in terms of its place within the curriculum, but in terms of its aims and the pedagogical practices that frame it. Within this context, the teaching of Ancient Greek began to be linked with broader concerns regarding the development of higher-order thinking skills, learner-centred learning and the formation of active and reflective citizens.

In light of the above findings, the present study argues that the future of Ancient Greek in Cypriot education is connected not only with the preservation or strengthening of its place within the curriculum, but also with the way in which it is taught. The use of interpretative, inquiry-based and creative forms of instruction can transform the ancient text from an object of linguistic decoding into a stimulus for critical reflection, creative expression and historical understanding. Through appropriate activities, Ancient Greek can contribute substantially to the development of students' critical and creative thinking. In this way, the subject will preserve its enduring cultural and educational value while simultaneously responding to the demands of contemporary education and the knowledge society, demonstrating that classical education can remain relevant and pedagogically productive in the twenty-first century.

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

The authors declare that ChatGPT (OpenAI) was used solely to assist with language editing and proofreading of the manuscript. Its use was limited to improving grammar, spelling, sentence structure, clarity, and overall readability of the text. No AI-generated content, ideas, interpretations, analyses, or research findings were incorporated into the manuscript. The study conception, research design, methodology, data collection, analyses, interpretation of findings, and conclusions are entirely the original work of the authors and were developed through the independent and systematic conduct of the research.

References

Anderson, L. W., & Krathwohl, D. (2001). *Taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.

Beghetto, R. A., & Kaufman, J. C. (2014). Classroom contexts for creativity. *High Ability Studies, 25*(1), 53–69.

Bista, P., Kokkinos, T., & Markoglou, A. (2016). Apopseis mellontikon ekpaideutikon gia tin didaktiki katartisi kai tin paidagogiki eparkeia [Views of future teachers on didactic training and pedagogical competence]. *Epistimes Agogis, 2*, 117–137.

European Commission. (2018). *Council recommendation of 22 May 2018 on key competences for lifelong learning*. Official Journal of the European Union.

Facione, P. A. (2009). *Critical thinking: What it is and why it counts*. Insight Assessment.

Frydaki, E. (2015). *I epangelmatiki tautotita toy ekpaideutikoy kai to mellon tis didaskalias* [Teachers' professional identity and the future of teaching]. Kritiki.

Kakridis, F. (1994). I didaskalia ton Archaion Ellinikon apo to prototypo [The teaching of Ancient Greek from the original text]. *Filologos, 75*, 7–20.

Kassotakis, M. (2010). To provlima tis paidagogikis kai didaktikis katartisis ton Ellinon ekpaideutikon tis Defterovathmias Ekpaidefsis kai oi prospatheies antimetopisis tou sti metapoliteftiki Ellada [The problem of the pedagogical and didactic training of Greek secondary teachers and efforts to address it in post-authoritarian Greece]. In *Praktika tou 1ou Epistimonikou Synedriou tis Enosis Ekpaideftikou Prosopikou S.E.P.-A.S.P.AI.T.E.: I ekpaidefsi ton ekpaideftikon tis defterovathmias epangelmatikis kai technologikis ekpaidefsis stin Ellada* [Proceedings of the 1st Scientific Conference of the Association of Educational Staff S.E.P.-A.S.P.AI.T.E.: The education of teachers of secondary vocational and technological education in Greece] (pp. 293–317). A.S.P.AI.T.E.

Kazamias, A., Kassotakis, M., & Kladis, D. (1996). Anisychies gia tin ekpaidefsi tou didaktikou prosopikou tis Defterovathmias Ekpaidefsis [Concerns about the education of the teaching staff of secondary education]. In A. Kazamias & M. Kassotakis (Eds.), *I elliniki ekpaidefsi: Prooptikes anasygkrotisis kai eksygchronismou* [Greek education: Perspectives of reconstruction and modernization] (pp. 445–455). Sirios.

Kazazis, I. (2001). Attikismos [Atticism]. In A. Christidis (Ed.), *A history of Ancient Greek: From the beginnings to Late Antiquity* (pp. 1200–1213). Cambridge.

Koutselini, M. (1997). Curriculum as political text: The case of Cyprus (1935–1990). *History of Education, 26*(4), 395–407.

Koutselini, M., & Agathangelou, S. (2010). The gap between teachers' understanding of their teaching and students' experiences in secondary schools of Cyprus. In P. Cunningham & N. Fretwell (Eds.), *Lifelong learning and active citizenship* (pp. 70–82). CiCe.

Krathwohl, D. R., Bloom, B. S., & Masia, B. B. (1964). *Taxonomy of educational objectives: Handbook II: The affective domain*. McKay.

Mahoney, J. (2000). Path dependence in historical sociology. *Theory and Society, 29*(4), 507–548.

Makris, C. (2000). I didaskalia tou mathimatos ton Archaion Ellinikon sti scholiki taxi [The teaching of the Ancient Greek course in the secondary school classroom]. *Filologos, 102*, 576–589.

Markoglou, A. (2022). Structuring cooperative learning methods in Ancient Greek classrooms. *Journal of Classics Teaching, 23*, 45–54.

Markoglou, A. (2026). Cultivating students' critical thinking in the teaching of Ancient Greek in secondary education. *Journal of Classics Teaching*, 1–10.

Ministry of Education and Culture. (2015). *Teliki protasi tis epitropis gia tin anadomisi/anadiamorfosi toy orologiou programmatos spoudon dimotikis kai mesis ekpaidefsis pros ton Ypourgo Paideias kai Politismou k. Kosta Kadi* [Final proposal of the committee for the restructuring/reformation of the school curricula for primary and secondary education: To the Minister of Education and Culture, Mr. Costas Kadis]. Ministry of Education and Culture.

Ministry of Education and Culture, Educational Reform Committee. (2004). *Dimokratiki kai anthropini paideia stin Evrokypriaki politeia: Prooptikes anasygkrotisis kai eksygchronismou* [Democratic and humanistic education in the Euro-Cypriot state: Prospects for reconstruction and modernization]. Nicosia.

OECD. (2019). *OECD Learning Compass 2030*.

Persianis, P. (2006). *Sygkritiki istoria tis ekpaidefsis stin Kypro: 1800–2004* [Comparative history of education in Cyprus: 1800–2004]. Gutenberg.

Persianis, P. (2010). *Ta politika tis ekpaidefsis stin Kypro kata tous teleutaious dyo aiones (1812–2009)* [The politics of education in Cyprus over the past two centuries (1812–2009)]. University of Nicosia Press.

Pierson, P. (2000). Increasing returns, path dependence, and the study of politics. *American Political Science Review, 94*(2), 251–267.

Runco, M. A., & Jaeger, G. J. (2012). The standard definition of creativity. *Creativity Research Journal, 24*(1), 92–96.

Tsafos, V. (2004). *I didaskalia tis archaias ellinikis grammateias kai glossas: gia mia enallaktiki mathiteia ston archaio kosmo* [The teaching of Ancient Greek literature and language: Towards an alternative apprenticeship in the ancient world]. Metaichmio.

Tsiortas, V. (2008). I *archaia elliniki thematografia sto Lykeio: Symvoli sti didaktiki tou "adidaktou" keimenou* [Ancient Greek thematography in Lyceum: Contribution to the teaching methodology of the "untaught" text]. Dardanos.

Varmazis, N. (2008). *Didaktiki ton Archaion Ellinikon: Apo tin paradosi stin ananeosi tis didaktikis methodou* [Teaching of Ancient Greek: From tradition to the renewal of the teaching method]. Patakis.

Zekas, C. (2018). I didaskalia tis Archaias Ellinikis Glossas stin Kypro (2011–2015) [The teaching of the Ancient Greek language in Cyprus (2011–2015)]. *Studies in Greek Linguistics, 38*, 79–91.

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Inquiry Based Learning Pedagogy in Indigenous Learning Spaces

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Abstract

This paper is an attempt to explore, encourage and put to practice an inquiry-based learning methodology, in the rural and indigenous contexts of two villages in Chhattisgarh, in central India. Here, I, along with young women from the indigenous community work with young children in Open Learning Centers called "Srijan Shala" (translated as Abode of Creativity). The idea of birthing these mixed-age group learning spaces *within* the village was to place students in the womb of community "know-how." However, the traditional and largely outdated methodology of delivering knowledge in a didactic form, has compromised the capacity to question and ask questions. Learning is still largely outcome driven and measured with the yardsticks of exams, assessments and marks. The child's ability of constructing her own know-how and moves from sensory motor stage to concrete operational stage in a community-context – which has a rich repository of non-textualized know-how, to which the young of the community are active participants – is largely left out of the school context. As the rural schools in India, seek to replace this inherent inquiry based and cooperative know-how sharing in community-contexts with rote learning, memorization and overload of information, the urban elite schools are reverting to the pedagogy of inquiry. This necessitated us to reimagine the teaching learning methodology at Hamar Srijan Shala where curiosity and inquiry replace the predetermined content, shifting learning to the learners themselves. This paper attempts to bring forward a pedagogy where questions guide the imagination of what shall we learn today?

Keywords: decolonization, indigenous curriculum, Hamar Srijan Shala, inquiry-based learning pedagogy, community schools, indigenous life world

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Introduction

> The highest education is that which does not merely give us information but makes our life in harmony with all existence. But we find that this education of sympathy is not only systematically ignored in schools, but it is severely repressed. (Das Gupta, 2009, p. 126)

Education and learning have been at the core of many discourses among educationists, policy makers, teachers and parents. Where do they amalgamate and where do they diverge? Where do they overlap one another for knowledge creation and where do they remain separated like the two parallel tracks of rail, which never meet. There are many ideas and thoughts, varied philosophies, to the question of *what* education and learning *is* and thereby what knowledge is. Knowledge is also viewed differently, depending on where we look from.

Education as "a journey for learning to be fully human" has been at the core of "American Indian indigenous philosophy" (Cajete, 1994, p. 42) and perhaps that of other indigenous life worlds as well. It cannot be taught, given or assessed but derived, learnt, experienced and curated. Shaped and formed by the multiple *terroir* of human beings – historical, geographic, cultural, social, political and religious. Though teaching learning pedagogy has molded and adapted to the changing times, this change is not visible in all contexts.

This paper endeavours to imagine a curriculum which does not merely educate but attempts to create a space where the learners themselves are *active participants* in curating their own learning; which is learning about themselves as well as the world around them. In the two villages of Dokal and Mardapoti in Chhattisgarh India, community-based learning spaces called "Hamar Srijan Shala" work on the idea of an inquiry-based learning practice.

The learners who come to Srijan Shala are in the age group of 3 to 9. The learners who come to this space are sometimes older too, from the age group of 9 to 14. They come with prior knowledge, difficulties in schoolwork and in search of a place for conversations. The mixed age group of the learners creates a perfect space to attempt query, inquiry and investigation.

This discussion unfolds though two questions and one ongoing journey.

1) To understand the idea of inquiry-based learning as a form of pedagogy and its relevance and role in shaping the idea of education.
2) To understand the context of the rural schools which lie deeply embedded within the indigenous communities and their teaching learning practices therein.
   The journey – tries to bring to dialogue Freire's "critical consciousness" and Krishnamurthi's idea – "to understand a child, one has to understand oneself" – through an inquiry-based pedagogy where it is not just an inquiry about the world but also an inquiry into "the inner world" (Kakar, 2012). The paper thus brings to dialogue *critical theory* (on education) and *self-transformation* (in education).

Idea of Inquiry-Based Learning as a Form of Pedagogy

Idea of Education

Illich points out that "our present idea of 'childhood' developed only recently, and the school system is a modern phenomenon, as also the childhood it produces" (Illich, 2021, p. 30). The idea of education, learning, knowledge and thereby schools as institutions that impart

knowledge have significantly shifted across the globe in the age of industrialization and post-industrialization. There is a specific type of value added to education received and imparted. The rise of the modern school is but a reflection of this insight of making students "job ready." The role of schools has shifted from being a space of creating knowledge to a space of dissemination of information. Weighed by the often-used yardsticks of exams, tests and assignments, abilities and capacities of children are honed to be either quite specific or at best, bound into strict silos. Needless to reiterate, this is in contradiction to the philosophy of education in indigenous life worlds, which is largely a "journey for learning to be fully human" (see Cajete, 1994 above) and also not in terms of Tagore-ian humanness or Freire-ian critical inquiry. Schooling as a concept has been under much criticism and is often described as unnatural and deliberate. The use of "improved techniques" to restore the disrupted "natural balance" which necessitated the emergence of schools. "Formal schooling has no intrinsic value but becomes necessary when humanity creates a condition in which one must become 'educated' to get along" (Fukuoka, 2025, p. 16).

Amidst the mushrooming of schools offering a smorgasbord of content, programs, pedagogy, philosophy and environment, the business of education has a lot to offer the young. However, *what* children learn is also guided by *how* they learn. The content, context and praxis shape the educational journey of the young learner, right from her pre-school years. This does not happen in isolation within the walls of an institution. It happens everyday in every possible way. It is embedded in every experience that a child has. Experiences and interactions with oneself, one's immediate family, the community at large, the social and natural environment, the food that is consumed and the games that are played. Nature and proximity to nature provides a bed for unique irreplaceable learnings which in turn becomes a rich repository of empathy and cognitive abilities, used for the unpredictable vagaries of life.

For Tagore, the natural world and constant contact with it is essential for balanced human growth. The basis of his "decolonization of pedagogy" is respect and love for the child's spirit; a spirit that is adventurous and cautious, affectionate, free, robust, curious, eager to learn, and at the same time vulnerable. He called his schools "poems in a medium other than words" (Mukherjee, 2021, p. 3).

Learning thus cannot be completely pre-conceived and pre-planned. Incidental learning and the context of the learners play a significant role here as that would largely determine what is needed and valued and hence included in the teaching learning practices. "The life of a child is immersed in social milieus" (Halbwachs, 2014, p. 68). Communities in which children live and learn as members of the group, equally lending their intellect, energy, labour and imagination are thereby the spaces from where they glean skills of living in this world. Education, outside the periphery of the learner's world often becomes routine, structured, and reinforced. The "one size fits all" kind of education bound by the walls of a classroom and the scriptures of the curriculum, finds itself deficient in two aspects – (a) imagination and (b) freedom of inquiry.

Phenomenology of Inquiry

The content of learning or curriculum, in educational institutions, is completely determined by the policies, framework, requirements set aside and developed by a specific group of people with a certain data or sample in perspective. The context of the child, their life worlds, dispositions, interests, searches and exploration are left for projects and extra-curricular activities. They are easily *othered* in the collective of the topics, subjects and concepts that are deemed to be higher in the hierarchy of learning. An inquiry-based learning pedagogy would

perhaps enable us to rethink the epistemology of the teaching learning processes for young learners in schools today.

Can knowledge be developed in a controlled environment which is largely determined by rules, discipline and utility? This is a question that has been at the forefront of many discussions by educationists over time.

Gijubhai Bhadeka in his work *Divaswapan* (*A Daydream*), writes about the controlled milieu of a school where facts and information are given out to students without an inkling towards their emotional disposition. Teachers working under the strict supervision of the principal who is bound by the curriculum, planned and regulated by the education department. The room to improvise or reimagine is subjected to the year end exams and the specific way they are conducted as well. Gijubhai took up the initiative to introduce novel perspectives in the established school scenarios and working culture. Incremental changes and patience finally enabled him to establish his idea that there are multiple ways to educate (See *Diwaswapan*, Gijubhai Bhadeka https://archive.org/details/Divaswapna-English/page/n11/mode/2up). Written in 1931, *Diwaswapan* still resonates deeply within the practices of many educational institutions, especially in the rural indigenous spaces. Multiple factors contribute to a pedagogy which is entrenched in rote learning and memorization.

"Education is the exploratory and creative use of skills, and cannot rely on drills. It relies on the relationship between the partners" (Illich, 2021, p. 30). Interconnection between the learners and the educators can be a single most decisive factor to optimize learning. Spaces where the teachers and learners learn together breaks the hierarchical role of the teacher and the student. Knowledge then becomes more organic and intuitive. The teacher is no more the giver and the learner is no more the mere recipient of the information.

Tagore in his imagination of school lays emphasis on the connectivity with nature. "I believe that children should be surrounded with things of nature that have their own educational value. Their minds should be allowed to stumble on and be surprised at everything that happens before them in the life of today" he writes in a letter to William Rothestein, in 1921 (Das Gupta, 2009, p. 126). The schools today are buildings of concrete, state of art spaces where technology meets the world of cognitive thinking. They are segmented, structured, focused and performative. The connection with nature is relegated to the potted plants, curated gardens and occasional field trips which are guided by objectives, purposes and methodology. The hierarchical role of the teacher and learners determines the temper of a classroom which is assessed by the outcome of the examinations.

Inquiry revokes, as Illich says, "the idea that one person's judgement should determine what and when another person must learn." In the rural indigenous contexts, it is also determined by who it is meant for? The "who" is the rural, indigenous, marginalized child. Guided by inquiry, the learner takes the responsibility of learning thereby shifting the hierarchical roles of learner and teacher, rearranging the structure of curriculum wherever necessary. There are schools which have reimagined their teaching learning practices, adapting and adopting different ideas and analytical approaches. However, these schools in India are confined to the urban contexts, where the earlier practices of learning by rote and memorization have been replaced by the concept of inquiry. "In most traditional systems of education including ours, the skills of analyzing and interpreting unfamiliar texts, constructing convincing arguments and developing approaches to problems are generally reserved for higher classes" (Jalaluddin, 2022, p. 226). Though largely practiced between the framework of curriculum and completing of the syllabus,

the need to develop inquiry or questioning is acknowledged. This places 'curriculum, pedagogy and valuation in a continuum' (Jalaluddin, 2022, p. 226) and not in isolated compartments. This perhaps also brings us to the constructivist approach to learning where "teaching and practice of learning is not isolated" but lies in the "process of meaning making" (Jalaluddin, 2022, p. 230).

How do we curate and initiate the process of inquiry especially among the learners from rural indigenous spaces where they are grappling with additional and perhaps systemic drawbacks. How do we then shift the focus from teaching to learning?

The Context of the Rural Schools and the Teaching Learning Practices

Schools in Rural Indigenous Spaces

Content of learning and context of the learners has perhaps nowhere been subjected to a deeper chasm than those in the rural indigenous spaces in India. The content of learning is imagined and developed not with "this" child in mind. The stories that she hears, the festivals that are celebrated, the culture that is prioritized, the hegemonic narrative of the dominant shadows the entirety of the teaching learning experiences. The child not only feels alienated but is also unable to participate actively. The schools in these contexts believe and practice the methods of rote learning, learning through memorization, copying and relentless writing as pathways for academic success and knowledge acquisition. The child is very much considered as the deposition ground of information rather than an equal participant in the process of learning. However, "learning for humans is instinctual, continuous, and the most complex of our natural traits. Learning is also a key to our ability to survive in the environments that we create and that create us" (Cajete, 1994, p. 24).

Inquiry being at the core of human existence is completely overlooked in the imagination of schools, in the rural indigenous contexts. A child from a rural indigenous context is born with the same instinct of curiosity. She has the similar "innate capacity or readiness to adapt to any culture into which (s)he may be received" (Kakar, 2012, p. 11). As she explores her surroundings through her sensory-motor abilities, the small step to the inner courtyard, the rise at the foot of the door frame, the clucking of the hens and the wetness of the ground near the handpump becomes familiar. She thereby adjusts her movements, constructing her knowledge, independently. Like any other toddler, she observes, assesses, reflects and comes to a learning. Taking ownership of what she has garnered and using it for future instances. Missing them often and yet forming layers of cognition and meaning-making quite independently. However, when this same child goes to school, she is bombarded with memorization of letters and numbers (not *how* or *where* to use them). Worse still, she is left at the periphery, abandoned and ignored in the many practices of the classroom. As she grows older, she is taught to follow the rules of her community, her tribe, her religion, her role in the household largely determined by her gender. In school, she is instructed to "listen to the teacher" and "copy" from the blackboard. School work and homework is largely filled with relentless copying from board to book and from books to notebooks. Little attention is given to the "understanding" of them and even less to how and where to use the letters and numbers thus learnt. Teaching is done from a podium where the teacher sits with the tools of memorization, practice and exams.

Interaction with the young learners at Hamar Srijan Shala, brings out this dichotomy between the idea of teaching and understanding of learning starkly. As a mixed age group open learning space, where the teachers and the learners are from within the community, Hamar Srijan Shala,

gives an opportunity to witness the present and the past. The possibilities and the impossible hurdles, the interest and enthusiasm and the aloofness and unaccountability (Mitra, 2026).

However, it will perhaps be incorrect to say that it is only in the context of the school that a rural child is not encouraged to question. The societal milieu of the rural indigenous and the marginalization by the dominant communities and urban spaces, inhibits the nurturing of the aspect of "questioning." "Self-depreciation is another characteristic" leading to "internalization of the opinion of the oppressor" (Freire, 1993, p. 37), renders the act of questioning a challenge difficult to overcome by mere acts of encouragement.

Urgency in the adult to "instruct" and "mold" the child was alien to Tagore for whom a child was never the "unproductive brute" obligated to a "process of intensive instruction" (Ghosh, 2017, p. 42). This idea of instructions pertains to learning spaces and social spaces. Questioning the norms, societal, cultural, filial, is still seen with a questioning glance, especially for the girl child. She has the relentless task of proving herself at every step of her journey until not questioning becomes the normalized behavior of the "dutiful daughter." Both the school and the larger community inhibit developing her questioning reflective self.

How do we then imagine a curriculum and pedagogy where questions, especially questions from the "indigenous life worlds and related worldviews" (Dhar, 2022) is evoked among a group of learners who are alienated from the content they are being introduced to and yet form a significant body of learners in India?

Journeying With Questions

"[Education is about] … establishing connections between knowledge in many directions" (Jalaluddin, 2022, p. 230).

Hamar Srijan Shala was envisioned to be that space for building connections – with self, with each other, the community and with the environment that surrounds us. These connections could not have been built without questions leading to their understanding. The need for curating a space that was different from the existing schools however needed the cooperation and collaboration of the community itself (Mitra, 2026). Conversation, discussions and readings with the members from the community laid the groundwork to delve into an alternative definition of education which reflected an "understanding of oneself" (Krishnamurthi, 2001, p. 14).

It was easier said than done as conventional schools – run by government and private operators were mushrooming in the nearby areas. The tag of private English medium school was too provocative to be ignored. Though the age-old, obsolete pedagogical practices still permeated every aspect, the occasional songs and rhymes (memorized) have their own magical allure. Moreover, a pedagogy of inquiry was an idea completely novel as it shifted the focus from teaching to learning. Our primary tasks were therefore:

a) an attempt to address the *hesitation to question* and
b) build a space for learning, where "*how* to question" was taught, encouraged, developed and nurtured.

There were other challenges that surfaced while introducing *inquiry as methodology*. They came in the form of the parents, community and the teachers. "Any given society within its broader epochal unit contains its own limit situations" (Freire, 1993, p. 76). Often these limit

situations are translated as inherent malaise rather than problems to be reflected upon. Problems that can be resolved, which have a solution. "Critical form of thinking about their world" (Freire, 1993, p. 77) is not only ignored but rather discouraged in many rural communities. Over generations this creates a non-questioning people whose mind and body has been conditioned to this state of being instructed. As we encourage young learners to ask questions, they couldn't be limited to those that are comfortable, evident and naturalized. Many adults in the community were however ready with the retort, "don't ask so many questions!" which brought us to reflect on possible ways to initiate this culture in the context of learning spaces. "Human activity consists of action and reflection" (Freire, 1993, p. 98).

The teachers (young women from the community) decided to have community meetings where the methodology of Hamar Srijan Shala, questions and questioning, was introduced and explained. The methodology of exams, as yardsticks of academic success was approached through the pathways of understanding and questioning. They acknowledged the need to ask questions to find out about the world around them. There was a trace of hesitancy as well, "what answers can we give?" The faith in their own capacity was limited simply because the content of the school was alien. "Mary had a little lamb," in the in primary school rhyme book, drew no semblance to anything familiar. The golden-haired Mary was a child from a distant world and hence alienated as well. The imagery of a child on her father's bicycle, going to school, through the path winding through the farms, would have perhaps encouraged questions and answers regarding weather, distance, nearby villages, farms, crops, and time! "To question" however was another hurdle to cross. Questioning as pedagogy resonated with the women of the community however, for their young daughters largely. Perhaps they perceived it as a window to question age old social practices which weighed down on the women. The teachers, daughters of the community, also explained the ease of "not knowing" the answer to a question. The idea was to attempt and shift the focus from "we do not have (m)any answers" to "we know many things about the world *we* inhabit" and for the parts that we don't, we will find it out together!

Questioning did not come easy to the children but having a mixed age group helped to facilitate it to a certain extent. The older children (age group of 5 to 8) who were attending schools found this space of query, quite novel. Hesitant and inhibited at first, they adapted to the routine of asking questions as an everyday practice. Questions at Hamar Srijan Shala, ranged from "what did you cook for lunch today?" to "when did you wake up?" The younger of the group were included too, in this practice of dialogue. Slowly and consistently, over a period of time, the temper of the questions altered. The children were curious to know where the rain came from? Why do we get mangoes only in the summer? Why do we pick "*mahua"* early in the morning? Why can't we enter the temple when we are menstruating? Why are the boys not helping with the housework? A perceptible shift from "asking questions" to "questioning" was at work. Swarnima Kriti's (2019) efforts at founding *Hamar Chinhari Welfare Society* was premised on the *questioning* of gender roles and the skewed sexual division of labour in the village. We wanted to take the same spirit of questioning to the Srijan Shalas.

Vignettes From the Evening Classes

Our imagination of Hamar Srijan Shala stemmed from the thoughts, ideas, perceptions and questions from within the community itself (Mitra, 2026). Perhaps that was the beginning of "questioning" that our young teachers embarked on. Working with the "teachers," seeing the disparity between the resources (the government and private schools, where most of the children of the community went) and expectation of performance (board exams, state level

exams, admission to colleges for higher studies) initiated the conversations. It also brought us to the question of what we wanted the learners to be able to do. A constructivist, inquiry-based idea in a mixed age group learning space was envisioned. Hamar Srijan Shala began its journey in January 2025, and we began with the topic of self and the family – ideas to which the learners had a priori knowledge and questions! The questions were dominantly asked by the teacher *didis* to which the young ones gave monosyllabic answers. These interactions, though encouraging, were not leading to an "inquiry." That is when the realization of the need to teach to ask questions became more evident. Slowly and painstakingly, with the help of games, strategies, role playing, involving members of the community for storytelling, familiar topics, connections and inquiry was established. The idea was not to present a program but "search for this program dialogically with people" (Freire, 1993, p. 97). Content of teaching learning or the curriculum imagined from within the community, opened up possibilities of connections which were unseen in their schools. The young of the group began to ask why and how. How did the cows know when to return home? Why do we go to pick mahua early in the morning?

The hot summer months had just begun in India when the story of "The Thirsty Crow" was read. It was a familiar story with an all too familiar setting of dried-up land and water scarcity looming on the horizon. It was discussed in the class as a part of the summer season, changes in the landscape and the difficulties faced during these months of intense heat. One of the students however had a different question, "why did the crow pick up pebbles, why not soil? Or sand perhaps?" This query led to finding it out for themselves over the next few days, what would be a suitable substitute for pebbles. Water was poured into the transparent cup, and children took turns to place the pebbles, sand and soil. The water inching up, was an excitement to behold. After experimenting with the materials, the verdict was in favor of pebbles. It did the job faster! However, there was another question, from the group to reckon with, "what would happen if both pebbles and sand were there? What will the crow put first and why?" The realm of questions also included "why does the soil in only some parts of the village have cracks in summer?" It was an opportune moment to introduce conversations on the environment and the rapid deforestation in many parts of the state. The role of the teacher as a facilitator, was to focus on the process rather than the outcome of answers.

The intense heat of summer does see the occasional thunderstorms. One such evening of pouring rain and absent children birthed entirely new activities, evoked from the sudden inclement weather. Once the children had returned, replete with the stories of rain and puddles, they also brought a question. "Where does the rain come from?" The obvious answer of "clouds" was challenged yet again with, "how does the water reach the clouds?" A barrage of imaginative answers, like "the trees send the water to the clouds," "maybe there is a pipe somewhere," "it's the rain God" provoked much laughter and counter suggestions! Putting aside heavenly intervention and mechanical ministrations for the time being, a big bowl of hot water and a stainless-steel plate was brought in to explore and understand evaporation! Rain brought in the exploration of materials to make an umbrella too.

There are times at Hamar Srijan Shala, when the learners are separated into those of primary school and middle school age group, to facilitate, encourage and develop reading and reflection on texts that were read. It was during such a reading session with the young girls of the middle school, when a Hindi translation of the book "The Hidden Lives of Trees" by Peter Wohlleben was read. The book was read by the girls, slowly and haltingly. The relentless reading, writing and copying in school had surprisingly not given them the ease of language. As they worked slowly towards understanding the forest as a community of trees, helping, supporting and nurturing each other, they shared instances of their experiences in the forests as well (this is an

agricultural community who are also dependent on the forest). They drew similarity between the forest and the group of girls, bound in friendship. Separate but inseparable, at least for the time being. They wanted to reflect what friendship was, what held them together, binding them to each other, what was it that they cherished and what was it they were critical about. The process of this activity though began with the learners from the middle school elicited responses from the rest of the group in later subsequent days to come. The very young ones displayed their understanding of friendship with hugs for whom they loved. The varied methods and mannerisms of reflection and answers not only opened up the idea of questions of cognition, but also a new space for conversations pertaining to self-reflection and inquiry within.

It was another evening at Hamar Srijan Shala. The children were gathered for a story as an introduction for a lesson about seasonal vegetables grown in most of the houses. The teachers took the path taken by the "hare and the tortoise," of the very popular fable that emphasizes staying on the task (the idea was to go to see the different vegetables grown in the *baadi)*. As the teacher completed her story, there was a sense of unease among some of the learners in the group. They had a simple query. "Why didn't the tortoise wait?" The class was encouraged to suggest a different ending for the story and the collective ideas of *waiting*, *sharing*, *waking up the hare* as well, were suggested. *Friendship* was evoked and self-reflection came in with ease. One of the learners, around the age of 11 years, mentioned tortoises as their totem and hence an animal of veneration. They look after each other. The human and the animal, entwined in the bond of kinship and care. Questions around totems were, however, significantly absent. Many stories of their tribes are lost to the younger generation in the community, loss of language, displacement and altered worldview of development have pushed the significance of spiritual practices into the realms of ritualistic habits, that too of the dominant.

That was a day when the roles of the learner and the teacher were reversed; when we learnt about the inherent and innate teachings of sharing and waiting from the youngest in our groups. Our perception of competitiveness, victory and defeat were questioned. Our ideas of success and failure were challenged. Questions and inquiry were not limited to cognition alone but challenged the very lens through which the world was seen.

Conclusion

Encouraging inquiry is not pertaining to information, facts or knowledge of the *outside* world alone. Inquiry is also an inquiry *within*. It is also about the *inner world.* It is a point of intersection between critical consciousness and self-reflective thinking; as also self-transformative processes. It is a process that questions the dominant practices, hegemonic narratives, the conditions and naturalizations of behavior and dispositions. As children are taught to question, reflect, observe, analyze, listen and understand, they also develop their imagination of other ways, other people, other knowledge systems, other worlds. Inquiry is not compartmentalized within academic extractive knowledge but can build an alternative mindset and world. It would perhaps develop "education in empathy" or as Tagore puts it, "bodher shadhona" (meditation of reflective consciousness; or meditative knowing). Constructing our own learning through connections necessitated decolonizing the way the rural indigenous are looked at. An inquiry-based pedagogy, an engaged classroom and active learners necessitate connections with the very life world the young are a part of, to be viewed in a continuum, not in isolation.

Imagination and inculcation of the practice of inquiry into the teaching learning experiences in the everyday life of the learner would lead to development of self-knowledge and knowledge about the world they inhabit. Learning not to view the world through the narrow scope of difference, profit and value, not mere acquisition of knowledge for benefit or extraction. Inquiry is perhaps the pathway leading to learning that is more engaged in the process. More entwined in praxis, on reflection, on community and conversations with the community, on learning from each other and with each other, on taking ownership of one's own learning guided by curiosity and questions.

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

The author declares that no AI or AI -assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, procedures, findings, analyses, and discussion are originally written and derived from careful and systemic conduct of the research.

References

Cajete, G. (1994). *Look to the Mountains – An ecology of Indigenous Education.* Kivaki Press. *P42.*

Das Gupta, U. (Ed). (2009). *Tagore Selected Writings on Education and Nationalism*. Oxford University Press.

Dhar, A. (2022). The Prop Roots of Postdevelopment Praxis: From Practical Philosophy to Transformative Philosophy. In F. U. Ahamed & M. S. Islam(Eds.), *Rethinking Development: Approaches and Practices in South Asia*. Cambridge Scholars Press.

Freire, P. (1993). *Pedagogy of the Oppressed.* Penguin Books.

Fukuoka, M. (2025). *One Straw Revolution*. Riverbank Dev Publishers.

Ghosh, R. (2017). *Aesthetics Politics Pedagogy and Tagore*. Springer.

Halbwachs, M. (2014). *The Collective Memory*. https://archive.org/details/collectivememory00halb/mode/1up

Illich, I. (2021). *Deschooling Society*. Aakar Books.

Jalaluddin, A. K. (2022). *From mindless to Mindful Classrooms.* Bodh Siksha Samiti.

Kakar, S. (2012). *The Inner World*. Oxford India.

Krishnamurthi, J. (2001). *What are you doing with your life?* Penguin Random House.

Kriti, S. (2019). Deconstructing Theory-Practice: Re-Thinking Methodology. *Journal of International Women's Studies, 20*(3), 62–73. https://vc.bridgew.edu/jiws/vol20/iss3/7

Mitra, A. (2026). Decolonising Education: Rethinking Early Childhood Education in Indigenous Spaces. *The Asian Conference on Education 2025: Official Conference Proceedings* (pp. 1565–1575). https://doi.org/10.22492/issn.2186-5892.2026.119

Mukherjee, H. B. (2021). *Education for Fullness*. Routledge.

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How to Safety Education Through Interactive Technology: Fire Safety Awareness and Preparedness

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Abstract

Despite widespread recognition of fire hazards, conventional fire safety education in schools — including brochures, instructional videos, and traditional classroom lessons — consistently fails to engage young learners or produce lasting behavioral changes. This study addresses a critical gap in educational practice by developing and evaluating an interactive, game-based learning tool designed to teach fire safety awareness and emergency preparedness to elementary, junior, and high school students in Japan. Grounded in gamification theory and design-based research, the game integrates interactive storytelling, rewards, and scenario-based decision-making to create an engaging and pedagogically effective learning experience. A pre- and post-implementation survey methodology was employed to assess changes in students' knowledge, attitudes, and preparedness. Initial findings from a pilot cohort indicate significant improvements in students' ability to identify fire hazards, recall emergency procedures, and respond appropriately in simulated scenarios. These results suggest that gamified educational tools represent a promising and scalable approach to disaster preparedness education, with implications for curriculum design, instructional technology, and community resilience at the K–12 level.

Keywords: gamification, game-based learning, disaster preparedness education, instructional technology, K-12 education

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Introduction

Effective disaster preparedness education remains one of the persistent challenges in K–12 schooling. Despite the well-documented risks of fire incidents — Japan's Fire and Disaster Management Agency recorded over 36,000 fire incidents and more than 1,400 fatalities in 2022 alone — the educational response has remained largely unchanged, relying on passive transmission methods that fail to build genuine competence or sustained awareness in young learners. These incidents not only cause immediate destruction but also leave long-term economic and psychological impacts on affected communities, underscoring the urgency of preparing for the next generation through more effective educational approaches.

The educational challenges are compounded by societal trends that intensify fire risks while simultaneously making traditional instructional methods less effective. Urbanization has produced densely populated environments where fire hazards can escalate rapidly, yet school curricula have not kept pace with the complexity of these contexts. Climate change contributes to more extreme weather conditions — prolonged heatwaves and droughts — that heighten wildfire risks, demanding more sophisticated and adaptive approaches to safety education. Industrialization further introduces unfamiliar hazards through flammable materials and complex machinery, creating new knowledge gaps that passive instruction is ill-equipped to address.

Our study addresses this need by integrating advanced technologies and public education to enhance community resilience against fire disasters. Technology alone cannot solve the problem; education plays a crucial role in preparing individuals and communities to respond effectively to fire emergencies. Our approach focuses on creating an engaging and educational tool that bridges the gap between knowledge and action, empowering users to make informed decisions during fire incidents.

A critical gap in current practice is the absence of engaging, learner-centered educational tools for fire safety. Existing resources — brochures, instructional videos, and traditional classroom lessons — consistently fail to capture the sustained attention of younger audiences. These methods are frequently perceived as disconnected from lived experience, resulting in poor retention and limited transfer of safety knowledge to real-world behaviors. Children in primary and secondary school are particularly vulnerable, given their limited prior experience and the procedural complexity of fire emergency protocols. Bridging this pedagogical gap requires innovative approaches that align with how young learners engage: through play, interactivity, and narrative.

This study responds to these challenges by applying a design-based research approach to develop a gamified educational tool for fire safety. Drawing on established principles of game-based learning — including intrinsic motivation, immediate feedback, graduated challenge, and scenario-based problem-solving — the game situates fire safety knowledge within engaging, interactive narratives. This hands-on approach not only reinforces declarative knowledge but also supports the development of procedural competence and confidence in responding to emergencies, making it particularly appropriate for K–12 educational settings.

Our hypothesis is that well-prepared instruments and trained awareness can reduce the risk and injuries in fire accidents. The independent variable in this hypothesis is the presence of well-prepared instruments and trained awareness, while the dependent variable is the risk and

injuries in fire accidents. By focusing on these variables, we aim to demonstrate that proactive education and preparedness can significantly mitigate the impact of fire disasters.

To test this hypothesis, we conducted a survey (see Table 1) and gathered feedback from users of our fire safety educational game. The data collected will allow us to assess the effectiveness of the educational content in improving fire safety awareness and preparedness.

We have developed the main ideas for our fire educational game, structuring its sections to engage users effectively. This foundation is crucial for attracting users and delivering impactful fire safety education. Our fire game is designed to address various aspects of fire safety, including prevention, emergency response, and post-incident recovery. Each section of the game is tailored to different learning styles, ensuring that all users can benefit from the content. For example, visual learners benefit from interactive simulations and animations, while auditory learners can engage with narrated scenarios and instructions (see Figure 1).

Our study will involve elementary, junior, and high school students in Japan, who will play the educational game and complete a questionnaire to provide feedback. This demographic was chosen because early education on fire safety can instill lifelong habits and awareness, significantly reducing the likelihood of fire-related injuries and fatalities. By targeting young students, we aim to create a generation that is better equipped to handle fire emergencies and contribute to overall community resilience.

The data analysis plan involves analyzing the questionnaire responses to identify areas for improving the educational game and evaluating users' game scores to determine which sections need enhancement and to identify gaps in students' fire safety knowledge. This comprehensive approach ensures that our educational tool is both engaging and effective in conveying crucial fire safety information. The analysis will involve both quantitative and qualitative methods, providing a holistic understanding of the game's impact. Quantitative data from the surveys will be statistically analyzed to measure improvements in knowledge and preparedness, while qualitative feedback will offer insights into user experiences and suggestions for further development.

Ultimately, our goal is to reduce the risk and impact of fire disasters on communities by equipping individuals with the knowledge and skills necessary to respond effectively to fire emergencies. By combining advanced technology with engaging educational content, we aim to create a tool that not only educates but also empowers users to take proactive steps in ensuring their safety and the safety of those around them. This study represents a significant step forward in fire safety education, leveraging modern technology to address an age-old problem in a way that is both innovative and impactful.

Method

The methodology for this study is designed to ensure a comprehensive assessment of the educational game's effectiveness in enhancing fire safety awareness and preparedness among elementary, junior, and high school students in Japan. The study involves multiple phases, including participant selection, game development, implementation, and data analysis.

Participants for this study are elementary, junior, and high school students from various schools across Japan. These students were selected based on their willingness to participate and their ability to access the educational game. Parental consent was obtained for all participants,

ensuring ethical compliance and safeguarding the well-being of the children involved in the study. The primary tool for this study is an educational game designed to teach fire safety.

The fire game features interactive sections that engage users and provide crucial information about fire prevention, emergency response, and safety protocols (see Figure 1). The game is accessible on various digital platforms, including tablets and computers, making it widely available to students. The fire game has been designed to cater to the cognitive and attention spans of elementary, junior, and high school students, incorporating elements of gamification to enhance user engagement. Before implementation of the game, a pre-implementation survey was conducted to assess participants' baseline fire safety knowledge and preparedness.

The survey included questions about basic fire safety concepts, emergency response procedures, and students' perceived confidence in handling fire emergencies (see Table 1). The survey served as a benchmark for measuring the impact of the educational game and will be used to evaluate changes in fire safety knowledge and preparedness following gameplay.

After the game has been used by the students, a follow-up survey will be conducted to assess changes in their fire safety knowledge and preparedness. This survey will mirror the initial survey, allowing for a direct comparison of pre- and post-implementation results. Alongside the post-implementation survey, feedback will be collected from participants regarding their experience with the game, including what they enjoyed, what they found challenging, and suggestions for improvement. Teachers and facilitators will also provide feedback on the implementation process and the students' engagement levels.

The data collected from the pre- and post-implementation surveys will be analyzed to measure changes in fire safety knowledge and preparedness. Statistical methods will be used to determine the significance of any observed changes, providing a robust evaluation of the educational game's impact. Survey responses will be quantified and analyzed using descriptive and inferential statistics, such as mean scores, standard deviations, and t-tests, while qualitative feedback will be coded and categorized to identify recurring themes, providing insight into the game's strengths and areas for enhancement and guiding future iterations of the educational tool. By combining quantitative and qualitative data, we will gain a comprehensive understanding of the educational game's effectiveness and identify opportunities for further development. This methodological approach ensures that our educational tool is both engaging and impactful, ultimately contributing to the reduction of fire-related risks and injuries in communities.

Table 1

Before Playing Fire Safety Game Questionnaire

No.	Question	Response Options
Section 1: Personal Information		
1	What school do you attend?	A. Elementary School Student B. Junior School Student C. High School Student
2	How old are you?	(open response)
3	What is your gender?	A. Male B. Female C. Other
4	Have you ever played a disaster-prevention game before?	Yes / No / I don't remember
5	Have you ever participated in a fire drill at school?	Yes / No / I don't remember
6	Have you ever experienced a fire in your home or its surroundings?	Yes / No / I don't remember

Section 2: Fire Safety Knowledge (Before the Game)		
1	Should you alert others by shouting “Kajida!” or “There’s a fire!”?	A. True B. False C. Maybe
2	Matches or lighters should not be placed where children can reach them.	A. True B. False C. Other
3	What should you do when a fire happens?	A. Hide under a desk B. Shout at others to run C. Stay calm, do nothing D. Inform neighbors, prepare to evacuate
4	What should you put in an emergency bag? (select all)	Drinking water; food (e.g., biscuits); comic books; flashlight; stuffed animals
5	What should you do escaping smoke from a fire? (select all)	Use elevator; wet towel over mouth/nose; open windows; stay low, cover mouth; run upstairs
6	Do you know where the emergency exits are in your home?	I know very well / I know a little / Not really / I have no idea

Note. n = 10.

Figure 1

Interactive Features (a) to (r) of the Fire Safety Game

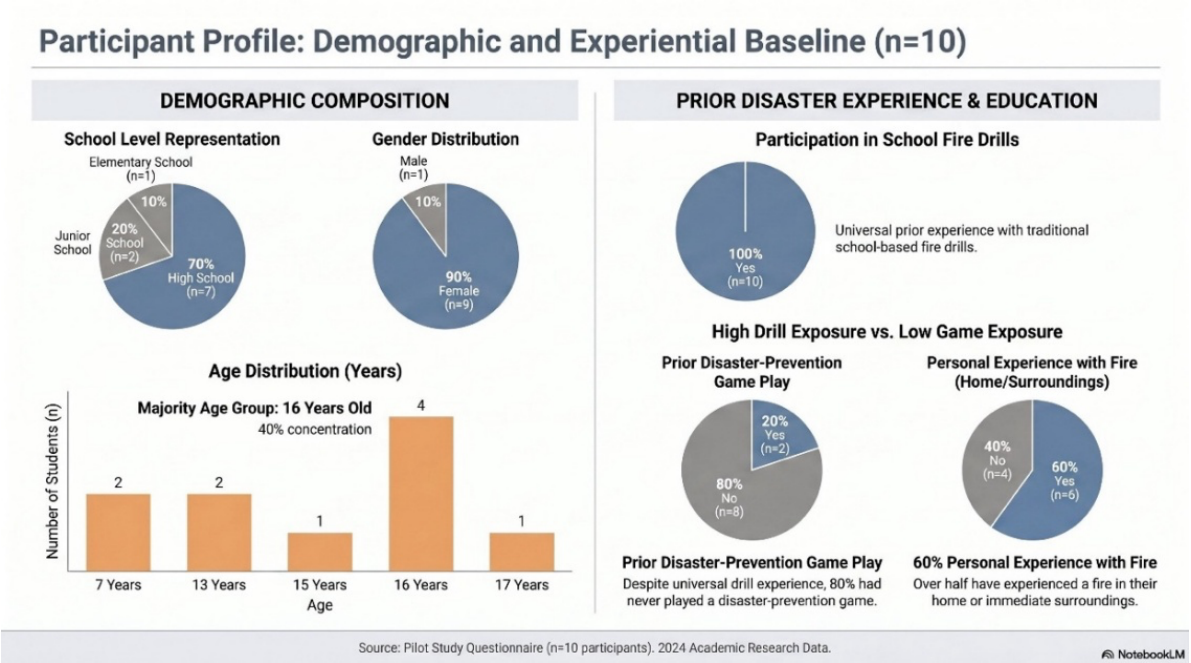
Results

Figure 2 shows the questionnaire results for the personal information of the children before they played the fire safety game. Seven high schools, two junior high schools, and one elementary school students, respectively, participated in the survey. The youngest respondent to complete the questionnaire was seven years old and the oldest was seventeen; most respondents were sixteen years old. The proportion of female respondents was greater than that of male respondents.

In this survey, twenty percent of respondents had played a fire-safety game before, while more than half of the respondents had no prior experience playing such games. All respondents had received prior fire training, and more than half of the respondents had experienced a fire at home or in their neighborhood.

Figure 2

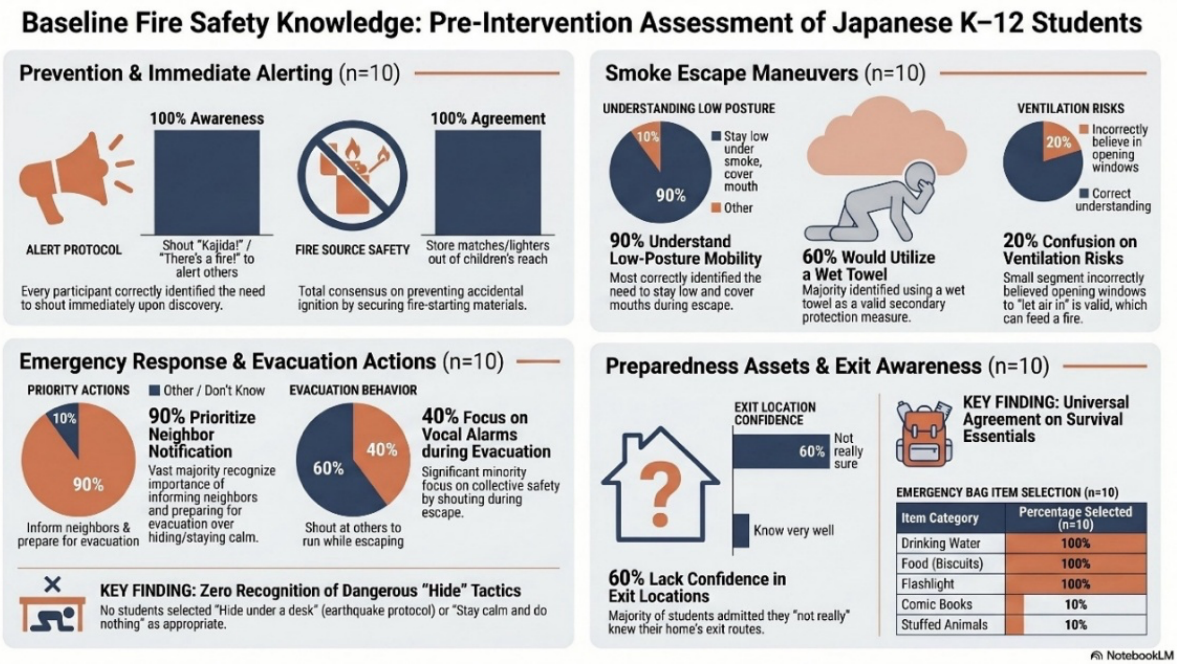
Section 1: Personal Information of Before Playing Fire Safety Game Questionnaire (English Version) Results



Note. n = 10

Figure 3

Questionnaire Results (i) to (vi) for Fire Safety Knowledge Before the Game



Note. n = 10

Figure 3 shows the questionnaire results for fire safety knowledge before students played the game. Figure 3(i) and (ii) show that all ten respondents agreed that they should shout "Fire!" to alert people nearby if they find a fire, and that matches and lighters should be kept out of the reach of children.

Figure 3(iii) shows that ninety percent of respondents agreed they should inform their neighbors and prepare to evacuate, while forty percent indicated they would shout at others to run from the fire.

Drinking water, biscuits, and a flashlight were the three items that all respondents chose to pack in their emergency bag (see Figure 3(iv)). Only ten percent would include comic books or stuffed animals in the emergency bag.

Figure 3(v) shows that ninety percent of respondents would stay low under the smoke and cover their mouth, and sixty percent would use a wet towel to cover their mouth and nose when escaping through smoke from a fire. Only twenty percent of respondents indicated they would open windows to let in more air, and no respondents selected using the elevator or running upstairs to find a safer place.

Figure 3(vi) shows that sixty percent of respondents did not know, and thirty percent knew only a little, where the emergency exits are in their home.

Our future is to increase the number of questionnaire responses by region in Japan, inviting elementary, junior, and high school students to play the game so that data obtained through the score system can serve as reference data for their baseline fire awareness.

Conclusion and Future Plan

In summary, as playing time increases, children can gather more of the items they need in a fire emergency and are better able to find an evacuation route to escape the site. This suggests that children's fire awareness and behaviors improve both in simulated fire scenarios and within the game itself, indicating that the game has a positive effect on fire education for elementary students. By integrating a well-structured methodology, control groups, realistic fire simulations, and long-term assessments, this project will contribute to safer school environments and enhanced community resilience against fire disasters.

Our future plan includes conducting further data analysis of questionnaire responses to identify areas for improving the educational game and evaluating users' game scores to determine which sections need enhancement and where gaps remain in students' fire safety knowledge. In addition, we plan to increase the number of questionnaire responses by region in Japan, inviting more elementary, junior, and high school students to play the game so that data obtained through the score system can serve as reference data for their baseline fire awareness. This score will be the average score per student, used to evaluate statistical tendencies across students. We also plan to develop a scenario in which a fire disaster is simulated within a building complex, using red ribbons moved by machines to represent fire and varying light brightness to represent smoke and lighting conditions during a fire.

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

The authors declare that NotebookLM, an AI-assisted tool, was used to assist in creating the graphics and visual materials presented in this manuscript, including figures illustrating the questionnaire results and the interactive game interface. The use of AI was limited to the generation and formatting of visual content and did not extend to the writing, analysis, or interpretation of the research. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Chuvieco, E., Aguado, I., Salas, J., García, M., Yébra, M., & Oliva, P. (2020). Satellite remote sensing contributions to wildland fire science and management. *Current Forestry Reports, 6*, 81–96. https://doi.org/10.1007/s40725-020-00116-5

Goswami, L., & Singh, D. (2022). Review study on development of fire detection technologies. *International Journal of Innovative Research in Engineering & Management, 9*(1), 491–494.

National Research Council, Division on Earth and Life Studies, Board on Earth Sciences and Resources, & Committee on Increasing National Resilience to Hazards and Disasters. (2011). *Building community disaster resilience through private-public collaboration*. National Academies Press.

Vajdová, I., Mikula, B., & Jenčová, E. (2019). The innovations improving fire services at airports. In *2019 New Trends in Aviation Development* (NTAD) (pp. 198–203). IEEE.

Van Kessel, G., Gibbs, L., & MacDougall, C. (2015). Strategies to enhance resilience post-natural disaster: A qualitative study of experiences with Australian floods and fires. *Journal of Public Health, 37*(2), 328–336. https://doi.org/10.1093/pubmed/fdu051

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A Systematic Review of Studies on Pragmatic Language Skills in Individuals With Autism: A Bibliometric Analysis

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Abstract

Autism spectrum disorder is a neurodevelopmental disorder characterised by significant difficulties in social communication and interaction. A key component of these difficulties is the impairment in pragmatic language skills, which refers to the ability to use language appropriately and functionally within a social context. Pragmatic language skills play a critical role in the social adaptation and communication competence of individuals with autism in daily life. The aim of this study is to present the studies conducted on the pragmatic language skills of individuals with autism in literature using bibliometric methods. In this study, publications on the pragmatic language skills of individuals with autism were examined both in terms of content and bibliometrics, and general trends, authors, distribution by year, and other characteristics were presented with scientific and visual maps. Web of Science (WoS) was used to collect data. A total of 500 publications were identified by searching for the term's "autis*" and "pragmatic language" and passing through various screening processes. Content analysis and bibliometric analysis were used to analyse the data. The study identified the distribution of publications by year, the most prolific authors, the journals with the most publications, and the countries. Furthermore, visual maps were created using co-author, co-citation, and co-word analyses, and the findings were discussed considering the literature in the field.

Keywords: autism, pragmatic language, bibliometric analysis

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Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in social communication and interaction, as well as restricted and repetitive patterns of behavior (American Psychiatric Association [APA], 2013). Pragmatic language difficulties, a core feature of ASD, involve impairments in the functional use of language in social contexts; this negatively impacts individuals' daily communication skills, peer relationships, and social adaptation (Bishop, 1998; Tager-Flusberg, 2000). Pragmatic language encompasses complex communicative skills such as taking turns in conversation, maintaining a topic, making contextual inferences, interpreting nonverbal cues, and understanding figurative language (Adams, 2002; Martin & McDonald, 2003).

The nature and scope of pragmatic language disorders in ASD have been the subject of growing research interest over the past three decades. Early studies have shown that individuals with ASD experience significant difficulties at the pragmatic level, even when their structural language skills are relatively intact (Volden & Phillips, 2010; Young et al., 2005). This finding suggests that pragmatic language serves as a critical indicator for an ASD diagnosis and should be a primary target of intervention programs (Parsons et al., 2017).

The rapid proliferation of research in the fields of OSB and pragmatic linguistics necessitates a systematic evaluation of this body of work. Bibliometric analysis is a research approach that examines scientific publications in a specific field using quantitative methods and holistically reveals the field's structure, development process, and intellectual patterns (Aria & Cuccurullo, 2017). This method allows for the systematic identification of leading researchers in the field, high-impact studies, core journals, international collaboration networks, and thematic research clusters (Donthu et al., 2021). Bibliometric analyses offer a panoramic perspective that goes beyond traditional systematic reviews, particularly in large-scale and multidisciplinary fields (Zupic & Čater, 2015).

The aim of this study is to comprehensively examine the bibliometric characteristics of research conducted in the fields of autism spectrum disorder and pragmatic language, thereby elucidating the scientific development of the field. Accordingly, 500 publications identified in the Web of Science Core Collection database using the keywords "autis*" and "pragmatic language" were analyzed for their publication years, leading journals, most productive researchers, and countries. Additionally, the study aimed to present an overview of the current body of knowledge by mapping the field's intellectual structure, collaboration networks, and research themes through analyses of co-authorship, co-citation, and keyword co-occurrence.

Method

This section provides detailed information on the research model, the research process, and the analysis of the data.

Research Model

This study conducted a bibliometric analysis of scientific publications on autism spectrum disorder and pragmatic language. Bibliometric analysis is a systematic method based on quantitative measurements of publications, authors, journals, and citations, aimed at revealing the structure, development, and impact of a research field (Zupic & Cater, 2015). This approach enables the visualization of the body of knowledge in the field and the

identification of key research patterns. Within the scope of this study, the bibliometric analysis method was chosen to systematically and objectively identify the development trends, influential researchers, publication sources, and research themes within the extensive literature on autism spectrum disorder and pragmatic language.

Process

The data for this study were obtained from the Web of Science (WoS) Core Collection, which is recognized as one of the most comprehensive and reliable academic databases worldwide. The database search was initiated in January 2026 and completed in June 2026; an advanced search strategy was applied using the keywords "autis*" and "pragmatic language" together in the Topic (TS) field. The use of the wildcard (*) operator allowed for the simultaneous search of different forms such as autism, autistic, and autistics. No restrictions were applied regarding publication year or language; the search was limited only to journals indexed in the Web of Science Core Collection. This search yielded a total of 500 publications published between 1991 and 2026.

The study examined the following bibliometric indicators: (1) Distribution of publications by year—to reveal the field's growth trends over time; (2) Top-producing journals — to determine the publication ecology of the field; (3) Most productive authors — to identify leading researchers in the field; (4) Publication distribution by country — to identify geographical contributions and patterns of international collaboration. These findings were obtained through the WoS Citation Report. In addition, co-authorship analysis was conducted to reveal collaboration relationships among researchers; co-citation analysis was performed to visualize relationships among co-cited sources and the field's intellectual structure; and co-word analysis was carried out to determine thematic structure and research foci within the field.

Data Analysis

The Web of Science platform's built-in "Analyze Results" tool was used to process and analyze the data. Through this tool, frequency distributions were obtained for basic bibliometric indicators such as publication year, source journal, author, country/region, and citations. The obtained data were exported in the plain text (txt) format, which is widely preferred for academic use, and imported into the VOSviewer software for bibliometric mapping analyses.

Findings

The findings are presented under this heading.

A search conducted in the Web of Science Core Collection database using the keywords "autis*" and "pragmatic language" yielded a total of 500 publications. The publications in the dataset span the years 1991–2026. The studies included in the analysis represent more than 15 countries, and it was determined that the most cited publication had 256 citations. This overall picture indicates that the topic of pragmatic language skills in autism is a field of study that has been evolving over time and is being researched at the international level.

Figure 1
Distribution by Year

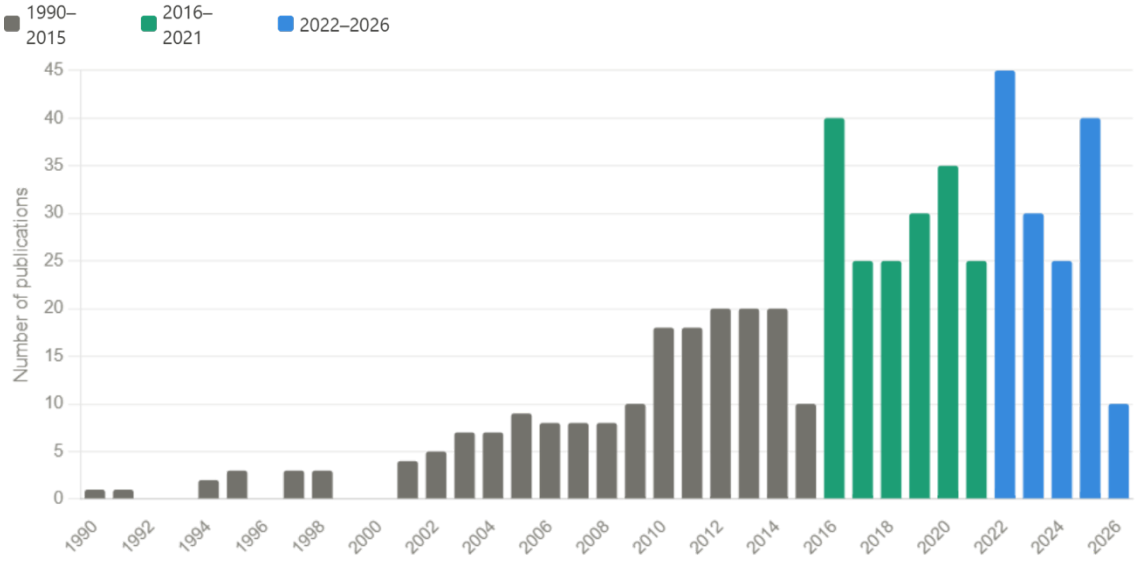

Figure 1 shows the distribution of publications in the field of autism and pragmatic language skills by year. The publications examined were published between 1991 and 2026. Publication numbers remained quite low in the early years but began to increase starting in the mid-2000s. A significant rise in publication output was observed after 2011, reaching 41 publications in 2017. The highest number of publications during the examined period was recorded in 2022, at 46. This was followed by 40 publications in 2025, 41 in 2017, and 35 in 2021. In recent years, publication numbers have generally remained at a high level, with 16 publications recorded for 2026.

Figure 2
Distribution of Authors by Number of Publications

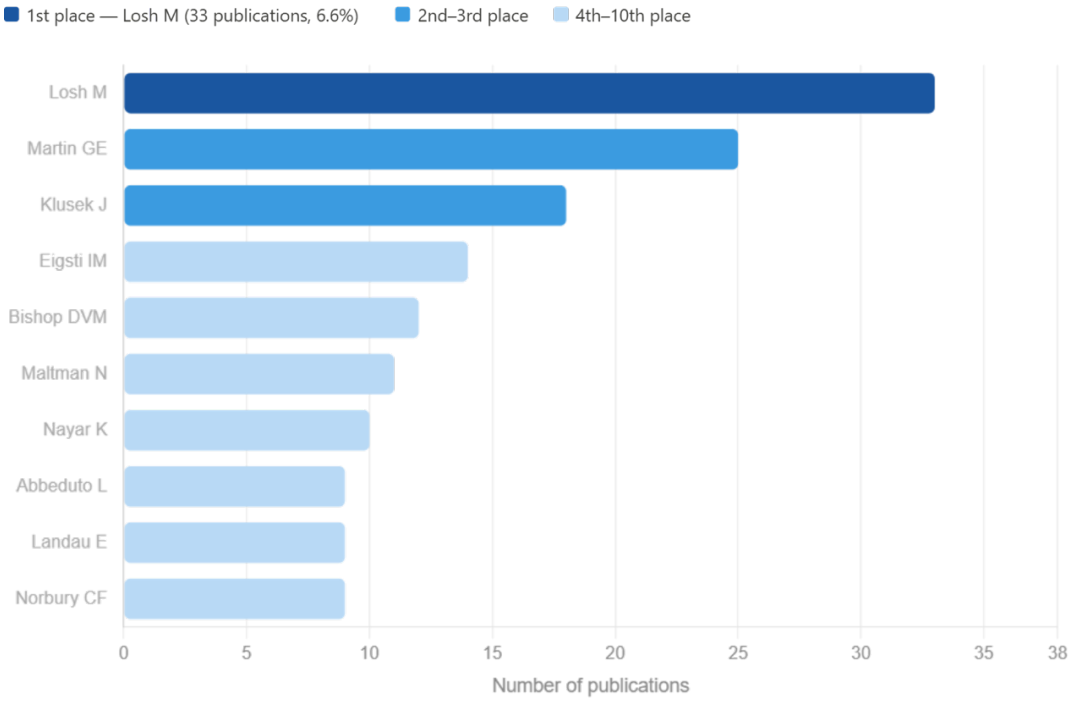

Figure 2 shows the authors who have published the most in the field of autism and pragmatic language skills. According to the analysis results, Losh M. ranks first as the most productive author with 33 publications. This author is followed by Martin G. E. (25 publications) and Klusek J. (17 publications). Other leading authors include Eigsti I. M. (14 publications), Bishop D. V. M. (12 publications), McIntyre N. (11 publications), Nayar K. (10 publications), Abbeduto L. (9 publications), Landau E. (9 publications), and Norbury C. F. (9 publications). The findings indicate that the field's publication output is concentrated around specific researchers, with Losh M., Martin G. E., and Klusek J. standing out as the authors who have contributed the most to the literature.

Figure 3

Distribution of Journals by Number of Issues

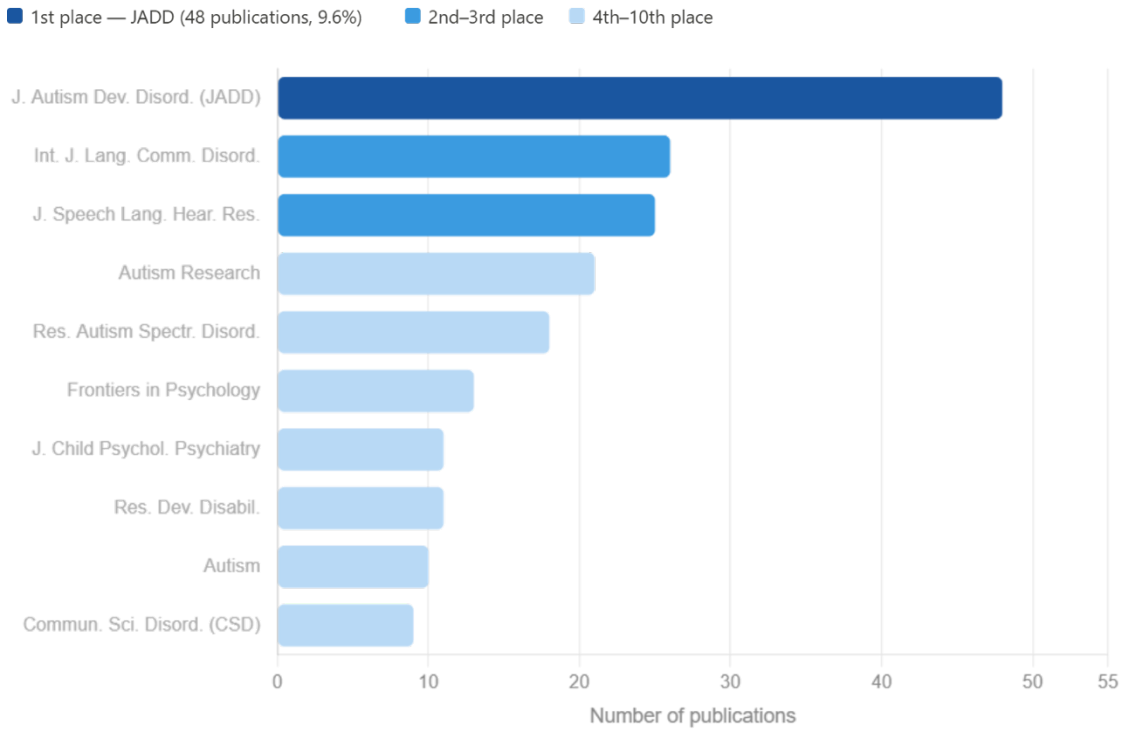

Figure 3 shows the journals with the highest number of publications in the field of autism and pragmatic language skills. According to the analysis results, the journal with the highest number of publications is the *Journal of Autism and Developmental Disorders* (JADD), which ranks first with a total of 48 publications. This journal is followed by the *International Journal of Language and Communication Disorders* (26 publications) and the *Journal of Speech, Language, and Hearing Research* (23 publications). Other leading journals include Autism Research (20 publications), Research in Autism Spectrum Disorders (17 publications), Frontiers in Psychology (13 publications), the Journal of Child Psychology and Psychiatry (11 publications), Research in Developmental Disabilities (11 publications), Autism (10 publications), and Communication Sciences and Disorders (CSD) (8 publications). The findings indicate that the research is concentrated primarily in journals publishing in the fields of autism, language and communication disorders, and speech-language pathology.

Figure 4
Distribution of Publications by Country

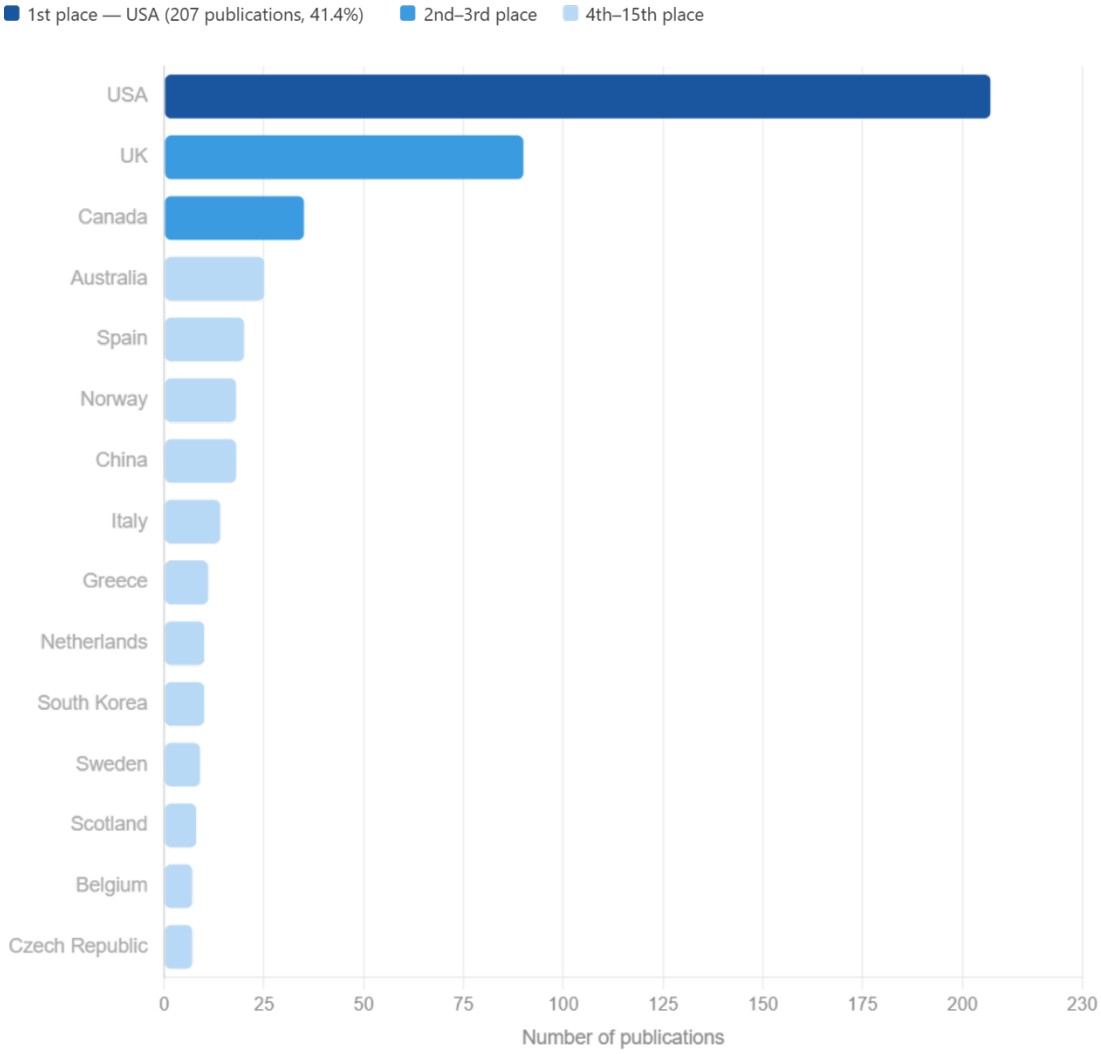

Figure 4 shows the distribution of publications in the field of autism and pragmatic language skills by country. According to the analysis results, the United States (U.S.) ranks first as the country with the highest number of publications, with 207 publications (41.4%). The US is followed by the United Kingdom (86 publications) and Canada (36 publications). Other leading countries include Australia (30 publications), Spain (26 publications), Norway (22 publications), China (21 publications), and Italy (19 publications). Additionally, Greece, the Netherlands, South Korea, Sweden, Scotland, Belgium, and the Czech Republic are among the countries contributing to this field of research. The findings indicate that publications in the fields of autism and pragmatic language skills are significantly concentrated in North American and European countries.

Figure 5
Authors' Collaboration Network

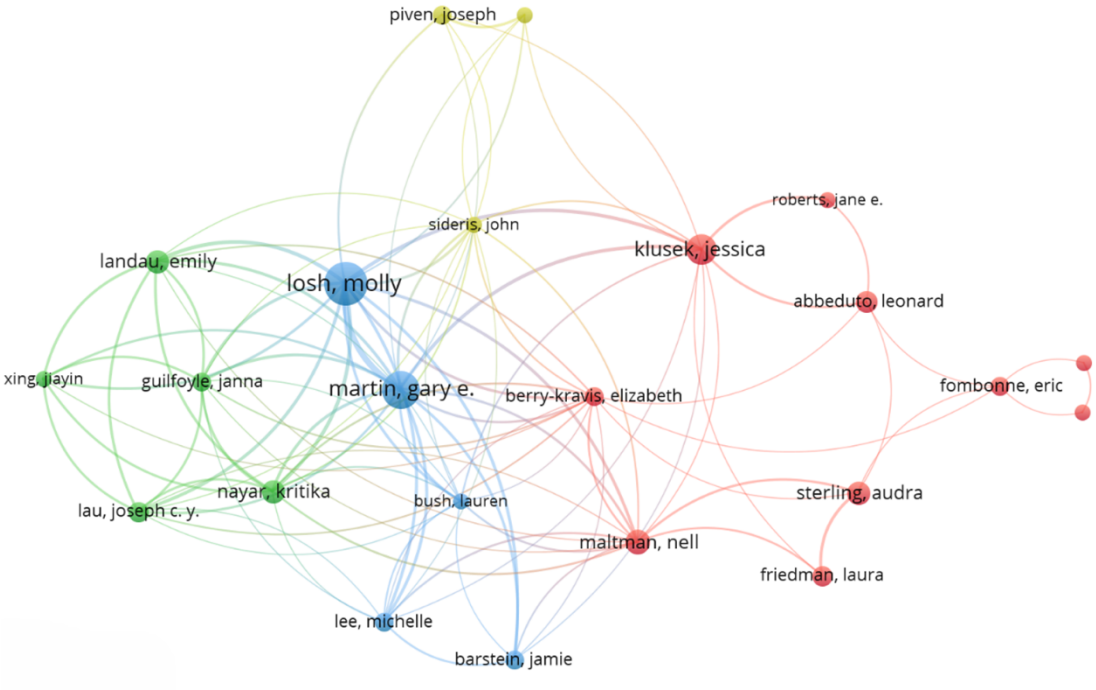

Figure 5 illustrates the co-authorship relationships among researchers publishing in the field of autism and pragmatic language skills. An examination of the network map reveals that researchers are grouped within multiple collaboration clusters. In the map, node sizes represent authors' levels of productivity, while connection lines represent co-authorship relationships. The analysis reveals that Molly Losh and Gary E. Martin stand out as the most central researchers in the network with the densest connections. These authors seem to have established strong collaborative relationships with researchers in different clusters. Additionally, researchers such as Jessica Klusek, Emily Landau, John Sideris, Kritika Nayar, and Joseph Piven were identified as key connection points in the co-authorship network. The network structure is divided into four primary collaboration clusters. While collaborations centered on Molly Losh and Gary E. Martin are concentrated in the blue cluster, the red cluster features a group of researchers centered around Jessica Klusek, Leonard Abbeduto, and Nell Maltman. The green cluster includes researchers such as Emily Landau, Janna Guilfoyle, and Kritika Nayar, while the yellow cluster has formed around John Sideris and Joseph Piven. The connections between the clusters demonstrate that researchers in the field collaborate not only within their own research groups but also across different research teams.

Figure 6
Co Citation Network

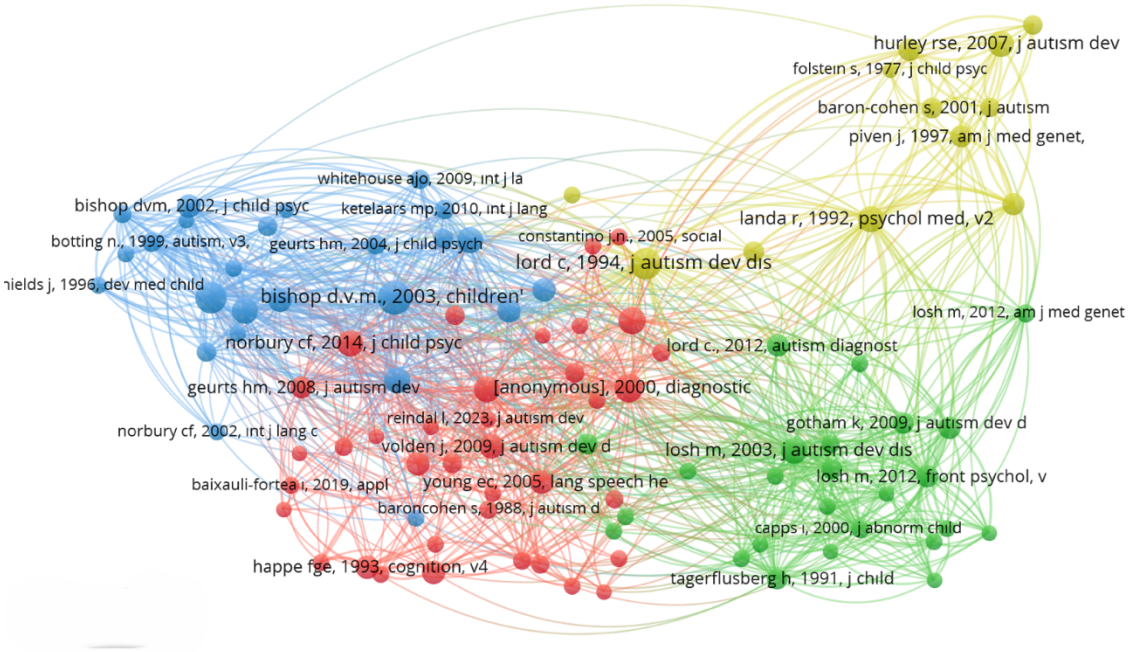

Figure 6 shows the co-citation network of studies in the fields of autism and pragmatic language skills. In the network map, nodes represent cited sources, node sizes represent the frequency of co-citations, and links represent the co-citation relationships between sources. The analysis identified four main clusters that are interconnected within the co-citation network.

The blue cluster includes studies focusing on language and communication disorders and pragmatic language development. In this cluster, studies conducted by Norbury (2014), Bishop (2002), Ketelaars (2010), and Whitehouse (2009) stand out. The red cluster contains foundational studies on pragmatic language characteristics, communication skills, and social interaction in autism. In this cluster, the works of researchers such as Young (2005), Eigsti (2007), and Happé (1993) are noteworthy.

In the green cluster, research focuses on social communication and pragmatic language competencies in autism, with studies by Losh (2003, 2012), Klusek (2014), Capps (2000), and Tager-Flusberg (1991) standing out as key nodes. In the yellow cluster, studies on the diagnosis of autism, its phenotypic characteristics, and genetic foundations are included, and it is observed that the studies conducted by Landa (1992), Baron-Cohen (2001), Piven (1997), and Hurley (2007) have high citation counts.

Overall, the network structure indicates that the literature in the fields of autism and pragmatic language skills is based on a knowledge base centered around language and communication skills, social communication, pragmatic language development, and the clinical characteristics of autism.

Figure 7
Shared Co Word Network

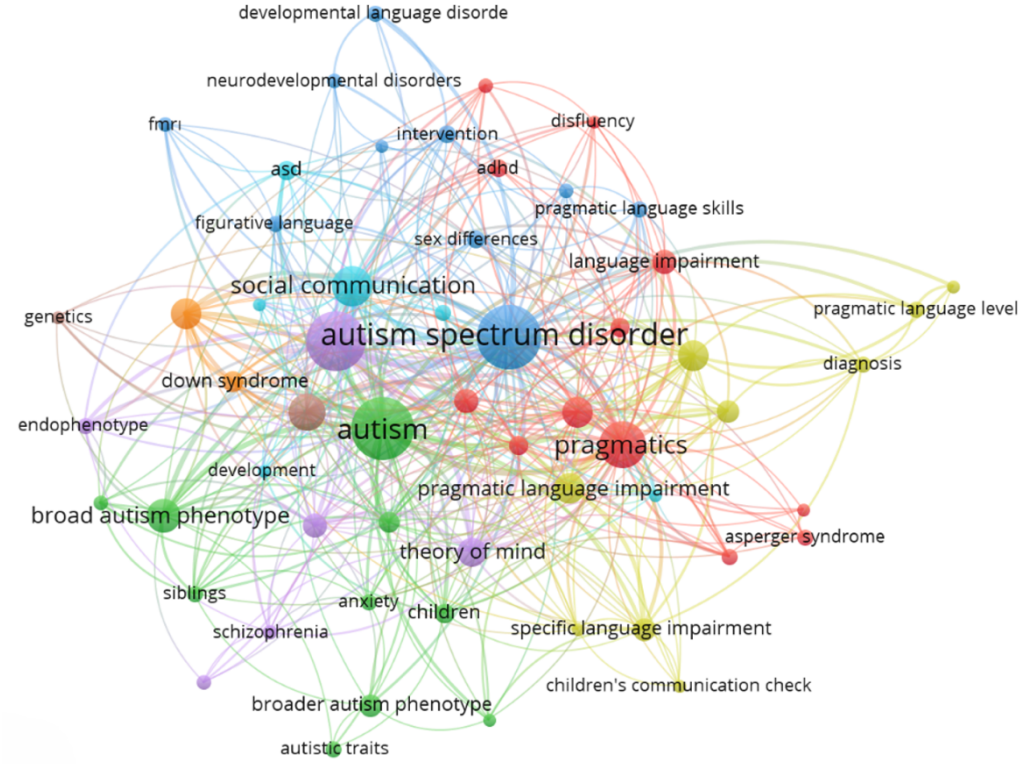

Figure 7 presents a co-occurrence network of keywords used in the field of autism and pragmatic language skills. In the network map, node sizes represent the frequency of keyword usage, while the links indicate the co-occurrence relationships between the words. The analysis revealed that the most frequently used keywords in the literature are “autism spectrum disorder,” “autism,” “pragmatics,” and “social communication.” These concepts are located at the center of the network and are seen to form dense connections with other keywords.

The co-occurrence analysis revealed various clusters representing different research themes. The blue cluster primarily includes concepts such as social communication, pragmatic language skills, developmental language disorder, neurodevelopmental disorders, and intervention. In the red cluster, terms such as pragmatics, language impairment, autism spectrum disorders, high-functioning autism, and Asperger syndrome stand out. The green cluster is centered around concepts such as theory of mind, children, anxiety, broad autism phenotype, and autistic traits. The yellow cluster includes assessment and intervention-focused concepts such as pragmatic language impairment, specific language impairment, diagnosis, assessment, and speech and language therapy. Additionally, the purple and orange clusters contain keywords related to research areas such as executive function, schizophrenia, fragile X syndrome, Down syndrome, and genetics.

Overall, the keyword network indicates that the literature is concentrated around themes such as autism spectrum disorder, pragmatic language skills, social communication, language disorders, assessment processes, and the broad autism phenotype.

Discussion

In this study, scientific publications in the field of autism spectrum disorder and pragmatic language skills were analyzed using bibliometric methods; a search of the Web of Science Core Collection database identified a total of 500 publications published between 1991 and 2026. The findings provide a comprehensive overview of the field's historical development, publication patterns, leading researchers, and intellectual structure.

An analysis of the distribution of publications by year reveals a marked increase in scientific output in the fields of autism and pragmatic language skills over time. In particular, there has been a notable rise in the number of publications since 2011, with the highest number of publications reached in 2022 (n = 46). This upward trend parallels the general growth in autism research and can also be linked to the increased research interest in social communication and pragmatic language skills following the publication of the DSM-5 (APA, 2013). Furthermore, current epidemiological findings indicating an increase in the prevalence of ASD (Maenner, 2023) and bibliometric studies highlighting the rise in publication output in the field of neurodevelopmental disorders (Donthu et al., 2021) support this growth trend.

According to the results of the journal analysis, the *Journal of Autism and Developmental Disorders* (JADD) stands out as the journal with the highest number of publications in the field, with 48 articles. This finding reflects JADD's central role in autism spectrum disorder research and aligns with the results of other bibliometric studies in the literature (Yin et al., 2022). JADD is followed by the International Journal of Language and Communication Disorders (n = 26) and the Journal of Speech, Language, and Hearing Research (n = 23). This indicates that research on pragmatic language skills is not limited to autism-focused journals but is also heavily represented in publications specializing in language and communication disorders. Furthermore, the fact that the top ten most productive journals account for 37.4% of all publications indicates that the literature is concentrated around a specific core group of journals.

The results of the author analysis indicate that scientific output in the fields of autism and pragmatic language is concentrated around certain researchers. The prominence of Molly Losh, Gary E. Martin, and Jessica Klusek as the most productive authors can be attributed to their comprehensive studies on pragmatic language skills, social communication, and the broad autism phenotype. Furthermore, findings from the co-authorship analysis also support these researchers' central positions within the field. In particular, the fact that Losh and Martin emerge as key actors connecting different research groups indicates that these researchers are influential not only in terms of publication numbers but also in fostering research collaborations and guiding knowledge production. These findings suggest that research in the fields of autism and pragmatic language is shaped around specific centers of expertise and research teams.

In the analysis of geographic distribution, the United States is the clear leader with 207 publications (41.4%), followed by the United Kingdom (86 publications) and Canada (36 publications). The United States' clear lead with 207 publications can be attributed to the country's strong research infrastructure and academic productivity in the field of autism research. The fact that the United Kingdom and Canada also rank high reflects these countries' research capacity in the fields of neurodevelopmental disorders and language and communication. The findings align with previous bibliometric studies that highlight the concentration of scientific output in specific geographic regions (Sweileh et al., 2016).

Publications from various countries indicate that research on autism and pragmatic language is an internationally recognized and increasingly expanding field of study.

A joint citation analysis reveals that the body of knowledge in the fields of autism and pragmatic language is structured around language and communication disorders, pragmatic language features, the broad autism phenotype, and the diagnostic and developmental characteristics of autism. The emerging thematic clusters reveal that the field is not limited to focusing solely on linguistic performance but encompasses a multidimensional research framework that also includes social communication, cognitive processes, and the developmental characteristics of autism. This finding aligns with theoretical approaches that emphasize the need to address the linguistic, cognitive, and social interaction dimensions of pragmatic language difficulties together (Martin & McDonald, 2003). The fact that the foundational studies included in the shared citation network have guided the conceptual and methodological development of the field for many years demonstrates that these sources form the intellectual foundation of autism and pragmatic language research.

An analysis of co-occurrence of keywords reveals that literature has developed around studies on autism spectrum disorder, pragmatic language, social communication, theory of mind, and intervention. The fact that the concepts of "autism spectrum disorder" and "pragmatics" are at the center of the network demonstrates that these concepts form the core research axes of the field. Furthermore, the prominence of keywords such as "social communication," "theory of mind," and "intervention" indicates that research focuses on both theoretical explanations and applied studies. Furthermore, the fact that concepts such as "fragile X syndrome," "broad autism phenotype," and "genetics" are grouped together indicates that studies examining the relationship between pragmatic language skills and genetic and phenotypic characteristics hold a significant place in the literature (Losh et al., 2012). Similarly, the fact that concepts such as "anxiety," "ADHD," and "schizophrenia" form a distinct cluster within the network reveals that pragmatic language skills are also addressed in the context of various neurodevelopmental and psychiatric conditions (Carruthers et al., 2022).

Conclusion

When the findings are evaluated as a whole, it is evident that the field of autism and pragmatic language skills has grown significantly in recent years, and that research output has concentrated around specific researchers, institutions, and journals. It is clear that the intellectual structure of the field has taken shape around interrelated themes such as language and communication disorders, social communication, genetic factors, and intervention research. Findings derived from keyword, co-citation, and co-authorship analyses reveal that the theoretical and applied dimensions of the field are developing in tandem. Furthermore, contributions from different countries and research groups indicate that research in the field of autism and pragmatic language is becoming an increasingly broad area of scientific interest. This study provides a comprehensive overview of the field's current structure and serves as a fundamental reference source for future research.

Based on the findings of this study, it is recommended that research in the fields of autism and pragmatic language skills be diversified to encompass different cultural and linguistic contexts, that interdisciplinary and international collaborations be increased, and that studies examining the relationship between pragmatic language skills and various neurodevelopmental characteristics be supported. Increasing research focused on assessment and intervention, particularly studies demonstrating the effectiveness of evidence-based

practices, could contribute to the field's development. Furthermore, expanding future bibliometric studies to include different databases and supporting bibliometric findings with systematic reviews and meta-analyses will enable a more comprehensive assessment of the body of knowledge in the field.

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

The author declares that DeepL, an AI-assisted language tool, was used during the preparation of this manuscript for translation and language refinement purposes. The use of DeepL was limited to improving linguistic accuracy, readability, and clarity. All ideas, analyses, interpretations, and conclusions presented in this manuscript are the author's own.

References

Adams, C. (2002). Practitioner review: The assessment of language pragmatics. *Journal of Child Psychology and Psychiatry, 43*(8), 973–987.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.).

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics, 11*(4), 959–975.

Bishop, D. V. M. (1998). Development of the Children's Communication Checklist (CCC): A method for assessing qualitative aspects of communicative impairment in children. *Journal of Child Psychology and Psychiatry, 39*(6), 879–891.

Carruthers, S., Taylor, L., Sadiq, H., & Tripp, G. (2022). The profile of pragmatic language impairments in children with ADHD: A systematic review. *Development and Psychopathology, 34*(5), 1938–1960.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research, 133*, 285–296.

Losh, M., Martin, G. E., Klusek, J., Hogan-Brown, A. L., & Sideris, J. (2012). Social communication and theory of mind in boys with autism and fragile X syndrome. *Frontiers in Psychology, 3*, 266.

Maenner, M. J. (2023). Prevalence and characteristics of autism spectrum disorder among children aged 8 years—Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2020. *MMWR Surveillance Summaries*, 72.

Martin, I., & McDonald, S. (2003). Weak coherence, no theory of mind, or executive dysfunction? Solving the puzzle of pragmatic language disorders. *Brain and Language, 85*(3), 451–466.

Parsons, L., Cordier, R., Munro, N., Joosten, A., & Speyer, R. (2017). A systematic review of pragmatic language interventions for children with autism spectrum disorder. *PLOS ONE, 12*(4), e0172242.

Sweileh, W. M., Al-Jabi, S. W., AbuTaha, A. S., Zyoud, S. H., Anayah, F. M. A., & Sawalha, A. F. (2016). Bibliometric analysis of worldwide scientific literature in mobile health: 2006–2016. *BMC Medical Informatics and Decision Making, 16*, 174.

Tager-Flusberg, H. (2000). Language and understanding minds: Connections in autism. In S. Baron-Cohen, H. Tager-Flusberg, & D. Cohen (Eds.), *Understanding other minds* (2nd ed., pp. 124–149). Oxford University Press.

Volden, J., & Phillips, L. (2010). Measuring pragmatic language in speakers with autism spectrum disorders: Comparing the Children's Communication Checklist-2 and the Test of Pragmatic Language. *American Journal of Speech-Language Pathology, 19*(3), 204–212.

Young, E. C., Diehl, J. J., Morris, D., Hyman, S. L., & Bennetto, L. (2005). The use of two language tests to identify pragmatic language problems in children with autism spectrum disorders. *Language, Speech, and Hearing Services in Schools, 36*(1), 62–72.

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods, 18*(3), 429–472. https://doi.org/10.1177/1094428114562629

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Peace Education in the School Context: A Reflection on Teachers' Perceptions and Practices

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Abstract

Peace education entails moving beyond a reductive conception of peace understood merely as the absence of war and redefining it as a positive and relational process rooted in everyday educational practices (UNESCO, 2023). From this perspective, peace education is conceived not only as an educational orientation aimed at transforming educational and cultural relationships, in line with Galtung's (2019) distinction between negative and positive peace, but also as a practice directed toward the construction of critical dialogue, grounded in Freire's conception of education as a dialogical process oriented toward emancipation (Freire, 1970, 1996), and in democratic pedagogies that identify cooperation and reflective inquiry as generative principles of educational processes (Dewey, 1916, 1938). Consistent with this perspective, contemporary research on peace education highlights the need to rethink pedagogical paradigms capable of addressing the complexities of contemporary educational contexts (Guetta, 2024). Building on this assumption, conflict is understood as a structural dimension of educational ecosystems and as a resource for transforming educational and relational processes (Lederach, 1997, 2005). Accordingly, an exploratory study was conducted to investigate the professional representations and educational practices of 266 teachers regarding peace education and their connections with conflict management. Qualitative data analysis, conducted using MaxQDA software, reveals a conception of peace as a multidimensional and everyday educational process associated with the development of relational and social-emotional competencies and classroom well-being. The findings also highlight teachers' recognition of conflict as a pedagogical resource, intentionally employed to foster reflection, dialogue, and the transformation of relational dynamics.

Keywords: peace education, conflict management, teaching, classroom climate, educational relationship

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Introduction

Peace education has assumed a central role in contemporary pedagogical debate, as it calls for a redefinition of the role of the school as a space for fostering democratic, inclusive, and coexistence-oriented relationships. Accordingly, within a context marked by social conflicts, cultural polarization, and relational fragility, peace cannot be understood merely as the absence of war but rather as a formative, relational, and transformative process that permeates the everyday life of educational settings. This perspective is consistent with the approach promoted by UNESCO, which, in its 1974 Recommendation, recognized the role of education in fostering international understanding, human rights, and cooperation, and which, in the more recent 2023 Recommendation, reaffirmed the centrality of peace education as a structural dimension of democratic education (UNESCO, 1974; UNESCO, 2023). From this perspective, peace studies have contributed to redefining the very concept of peace from an educational, relational, and transformative standpoint, providing theoretical frameworks that help explain the role of schools in fostering more equitable and inclusive contexts. A fundamental theoretical reference is provided by Johan Galtung, who distinguishes between negative peace, understood as the absence of direct violence, and positive peace**,** understood as the active construction of conditions of justice and equity aimed at counteracting structural and cultural forms of violence (Galtung, 1969, 1996). Accordingly, educating for peace entails not only recognizing the dynamics of exclusion and inequality but also promoting competencies oriented toward the transformation of relationships. This perspective is further developed by John Paul Lederach (1997, 2005), who conceives conflict as a generative dimension of relationships and as a potential opportunity for transformation. Within this framework, peacebuilding requires the creation of dialogical spaces grounded in mutual recognition and moral imagination, understood as the capacity to transcend immediate representations of conflict and open oneself to alternative relational possibilities. In continuity with this perspective, François Jullien (2026) introduces the concept of dé-coïncidence, referring to the possibility of distancing oneself from one's own representations without negating them. This cognitive displacement, which recalls the relational dimension, makes it possible to suspend the rigidity of one's own positions and to open a relational space in which the Other can emerge in their alterity. From this perspective, the transformation of conflict requires a reflective engagement with one's own positions. Applied to educational contexts, this perspective underscores the centrality of reflexivity within the teaching profession. As highlighted by Donald A. Schön (1983), professional practice cannot be reduced to the technical application of predefined procedures; rather, it entails the professional's capacity to critically interrogate their own representations and to re-elaborate them within practice. Accordingly, conflict management and the construction of peace-oriented educational contexts also depend on the meanings through which teachers interpret relationships, make sense of conflict situations, and conceptualize peace education. Consequently, the transformation of conflict depends not exclusively on educational situations themselves but also on the meanings through which those situations are interpreted. Within school contexts, teachers interpret conflicts, attribute meaning to relationships, and guide their actions on the basis of specific professional representations, which concretely influence the ways in which coexistence is fostered and relational dynamics are managed. The literature highlights how these interpretative frameworks profoundly shape educational practice. For example, Ingrid Hakvoort, Karin Larsson, and Anna Lundström (2020) show that teachers understand conflict through different interpretative lenses, ranging from rule transgression to relational vulnerability, and that these perspectives significantly influence their educational responses. Consistent with this line of research, Buchori et al. (2021) found that teachers' peace capacity develops through the interaction of knowledge, attitudes, and competencies oriented toward nonviolence, thereby confirming the centrality of the professional dimension in

promoting peace-oriented educational practices. Returning to the centrality of professional representations, this perspective is particularly evident with regard to the social-emotional and relational dimensions that characterize educational contexts. Indeed, Taylor et al. (2020, 2022) demonstrate that empathy and the quality of intergroup contact significantly influence attitudes and prosocial behaviours, showing that the construction of relationships also depends on the ways in which the Other is perceived and interpreted. Complementing this perspective, O'Driscoll et al. (2020) found that specific beliefs may hinder these processes by limiting relational openness, thereby confirming the influence of representations in shaping social dynamics. These dimensions are inevitably reflected in educational and instructional practices. Paradoxically, López et al. (2022) highlight the complexity of the relationship between classroom management and school climate, demonstrating that even strategies perceived as punitive may be interpreted by educational actors as functional to coexistence. This suggests that the meaning of educational practices lies not solely in their implementation but also in the effects they produce and in the ways they are interpreted, negotiated, and legitimized within specific cultural and professional frameworks. Consequently, the construction of peace-oriented educational contexts requires critical and reflective engagement with the representations that shape educational practice. In light of these theoretical perspectives, the present study aims to explore Italian teachers' professional representations of peace education, considering the definitions and meanings they attribute to it as key elements for understanding how relationships, conflict, and coexistence are interpreted within school contexts. Although this contribution forms part of a broader research project also addressing classroom climate and conflict management, it presents a preliminary exploratory analysis focusing on the semantic and interpretative themes emerging from the participating teachers. Specifically, the analysis seeks to identify the interpretative categories associated with the concept of peace and to examine the main factors and dimensions that characterize educational practices aimed at fostering positive relationships and promoting democratic coexistence.

Methodology

Research Objectives

The present study is designed as an exploratory qualitative investigation aimed at eliciting the professional representations of a group of Italian teachers and examining their definitions of peace, the meanings associated with it, and the educational and instructional strategies they adopt. The data presented in this paper are drawn from a broader research project that also investigated classroom climate and conflict management within school contexts. This contribution focuses on the first phase of the study, which was devoted to collecting teachers' perspectives, implicit theories, and professional practices developed around the concept of peace.

Sample Characteristics

The study involved 266 Italian teachers and therefore employed a non-probability, self-selected convenience sample, consistent with the exploratory and descriptive purposes of educational research (Cohen et al., 2018; Creswell & Creswell, 2018). The aim was to identify the main representations associated with the meaning of peace education and the educational dimensions related to it.

From a descriptive perspective, the sample consisted predominantly of teachers working in Italian public primary schools (74.1%), while the remaining participants were teachers from

other educational levels or employed in private schools. With regard to teaching experience, 50.4% of the participants reported more than 10 years of professional experience, 34.6% had between 4 and 10 years of experience, 10.9% had between 1 and 3 years of experience, and 4.1% were certified teachers who had not yet entered professional service. The participants' teaching areas reflected a heterogeneous disciplinary background, ranging from the humanities to the sciences. The largest subgroup (15.8%) consisted of special education teachers working with students with special educational needs. Although the sample is not statistically representative of the Italian teaching population, its non-probability and self-selected nature includes teachers from different Italian regions and educational levels, with the highest concentrations of participants coming from Lazio, Campania, Lombardy, Veneto, Sicily, and Calabria. The socio-demographic and professional information collected was used exclusively for descriptive purposes and to contextualize the sample and should not be interpreted as statistically representative of the Italian teaching population.

Instrument and Data Collection

Data were collected through the online administration of a questionnaire distributed via Google Forms. The instrument consisted of socio-demographic questions, structured closed-ended items using a Likert scale, and open-ended questions designed to explore teachers' professional representations of peace education, encouraging the emergence of definitions, meanings attributed to peace, perceptions of conflict management, and reflections on the educational resources and practices considered effective within school contexts. Prior to completing the questionnaire, participants were provided with an information sheet outlining the aims of the study and the procedures for data processing, and their explicit informed consent for the use of the collected data was obtained. Before the analysis, the dataset underwent a process of data screening and cleaning, during which questionnaires completed by individuals who were not members of school staff or were otherwise inconsistent with the objectives of the study were excluded.

Data Analysis

During the analysis process, quantitative data relating to the characteristics of the sample were analyzed using descriptive frequency statistics, while the textual data collected through the open-ended responses were analyzed through inductive thematic analysis with the support of MAXQDA software. Thematic analysis was adopted as a flexible method aimed at identifying, analyzing, and interpreting patterns of meaning within a textual corpus (Braun & Clarke, 2006, 2021, 2022). The analytical process was structured into several closely interconnected phases. In the first phase, familiarization with the textual corpus was achieved through repeated readings of the responses, with the aim of identifying semantic recurrences, conceptual themes, and recurring ways of representing peace. Subsequently, units of meaning were identified, and initial codes were generated based on the elements considered relevant to the objectives of the study. The codes were then progressively compared, reorganized, and grouped into broader thematic clusters through a recursive process of review and refinement aimed at verifying the internal coherence of the groupings and the distinctiveness of the emerging categories.

This process involved a continuous interpretative movement between the empirical data, the relevant literature, and the adopted theoretical framework, allowing the interpretative categories to be progressively refined. Consistent with the reflexive thematic analysis approach developed by Braun and Clarke (2006, 2019, 2021), themes were not regarded as elements that emerged neutrally from the data; rather, they were understood as the outcome of a process of

interpretation and progressive conceptualization, constructed through the interaction between the researcher, the data, and the underlying theoretical framework. Accordingly, the analysis focused not only on the frequency of lexical occurrences but also on the meanings that participants attributed to peace, relationships, and school coexistence.

MAXQDA software was used to support the organization of the empirical material, the coding of textual segments, the retrieval of coded occurrences, and the progressive development of thematic groupings, thereby facilitating a systematic and recursive management of the analytical process. Data coding was structured into three levels, in accordance with the analytical approach supported by MAXQDA. The first level was lexical and concerned the analysis of the terminology used by teachers to define peace education. Recurring words and expressions were coded into lexical groupings (*lexical families*) according to the criterion of semantic homogeneity, while preserving participants' original wording through in vivo coding (10 lexical families).

The second level was thematic-categorical and involved the identification of broader thematic clusters derived from the previous lexical groupings. These clusters were generated by aggregating units of meaning that either co-occurred or belonged to the same conceptual domain.

The third level was interpretative and consisted of assigning broader conceptual labels to the thematic clusters and developing a theoretical interpretation of the collected data.

Accordingly, this analytical structure made it possible to progressively connect the lexical dimension of participants' responses with broader interpretative dimensions, thereby revealing the ways in which teachers semantically and pedagogically construct the meaning of peace education.

Results and Discussion

The qualitative analysis of the open-ended responses made it possible to explore the ways in which teachers attribute meaning to peace education, revealing articulated and multidimensional professional representations. Indeed, the definitions provided by the participants were not limited to generic or abstract descriptions; rather, they reflected different levels of interpretation of peace, in which value-based, relational, educational, and experiential dimensions were intertwined. In particular, the analysis of the textual corpus revealed a dual representational framework through which teachers semantically construct the meaning of peace. Two distinct levels of analysis emerged: a definitional level and a descriptive level.

On the one hand, the definitional-lexical level is characterized by concise responses and stimulus words through which teachers attribute an immediate semantic status to peace, using expressions such as *necessary*, *fundamental*, and *indispensable*.

On the other hand, a descriptive-thematic level emerges, in which responses assume a more elaborate and narrative form, explicitly articulating the pedagogical, relational, and educational meanings associated with peace education.

Building on this distinction, the thematic coding process identified five main thematic clusters, reflecting the complexity of the professional representations that emerged. The first theme conceptualizes peace as a primary educational need or necessity. This cluster includes

expressions such as *necessary*, *fundamental*, *indispensable*, *essential*, *unavoidable*, *a priority*, *a foundation*, *a mission*, *an opportunity*, as well as *everyday*, *useful*, and *meaningful*. The recurrence of this vocabulary indicates that, from the teachers' perspective, peace education is not perceived as an ancillary or marginal aspect of schooling but rather as a constitutive dimension of educational experience and of the very purpose of education. A second theme conceptualizes peace as an intrapersonal or individual dimension of the person. In this case, participants referred to concepts such as *self-respect*, *serenity*, *inner growth*, *personal responsibility*, *self-awareness*, *emotional regulation*, *self-determination*, and *the ability to distinguish between right and wrong*. Peace education is thus situated at the level of the individual and, therefore, within an intrapersonal dimension. Before becoming a relationship with others, it entails work on oneself, one's emotional, ethical, and relational disposition. Peace is therefore interpreted as an inner balance and a condition of personal well-being. A third theme interprets peace as an educational process. This cluster includes references such as *continuous education*, *education for life*, *education for listening*, *education for choice*, *divergent education*, *training the mind*, *mediation*, *an educational pathway*, *the acquisition of cultural, emotional, and social competencies*, and *the promotion of nonviolent attitudes*. These responses indicate that peace is perceived as a continuous and cross-cutting educational practice, one that cannot be reduced to isolated activities or occasional interventions but rather permeates the entire educational process. Peace is therefore understood as an intentional educational pathway aimed at fostering relational, emotional, and cognitive competencies. The fourth theme concerns peace as an intersubjective and communal dimension. The recurring vocabulary includes terms such as *respect*, *inclusion*, *integration*, *interaction*, *sharing*, *active citizenship*, *respect for others' freedom*, *empathy*, *solidarity*, *justice*, *tolerance*, *kindness*, *collaboration*, *care*, *recognition of the other*, *coexistence*, and *collective well-being*. Within this cluster, peace takes the form of a relational and communal space. It concerns not only the individual but also the way in which individuals inhabit relationships with others. Accordingly, peace education can be understood as a social practice grounded in reciprocity and coexistence as constitutive dimensions of building positive relationships. Finally, the fifth theme conceptualizes peace as an ideal and value-oriented horizon**.** Alongside the vocabulary of necessity and everyday life, participants used expressions such as *beautiful*, *wonderful*, *harmony*, *utopia*, *ideal*, *abstract*, *victory over evil*, and *ideology*. This cluster reveals a significant semantic tension: peace is represented simultaneously as a concrete need and as a symbolic, desirable, and aspirational horizon. It therefore oscillates between a practical dimension and an ideal one, between everyday experience and a value-oriented projection. The five themes identified do not emerge as isolated categories but are instead strongly interconnected. Together, they are organized around a shared conceptual framework in which peace is understood as a dimension that simultaneously encompasses both the individual and the social spheres. Indeed, on the one hand, a tension emerges between peace as a primary necessity, rooted in everyday lived experience, and peace as an ideal horizon, associated with images of harmony and ethical aspiration. On the other hand, a polarity can be observed between the intrapersonal dimension, centred on the self and inner growth, and the social dimension, centred on relationships, coexistence, and reciprocity. These dimensions are unified by a strong process-oriented perspective, in which peace education is conceived as an intentional and continuous educational practice. Moreover, several excerpts provide direct insight into the participants' voices and illustrate the semantic richness of the representations that emerged. One teacher defines peace education as *"a form of everyday education that is reflected in the way one relates to students, colleagues, and all members of the school staff."*

Another participant states that educating for peace means *"managing the contradictions and the inherently human conflicts of life in a conscious way."*

In another response, peace is described as the ability to *"live together without hurting one another—neither with our hands, nor with our words, nor with our ideas."*

These excerpts demonstrate that the representations collected extend far beyond an abstract appeal to nonviolence. Rather, they refer to the relational, communicative, and everyday practices through which peace is constructed and negotiated within educational contexts. Taken together, the findings portray peace education as a multidimensional process in which educational need, personal development, intersubjective relationships, social competence, and a value-oriented horizon are closely intertwined. In the teachers' accounts, peace does not appear as an isolated curricular topic or merely as a moral exhortation to "be kind to one another"; rather, it is understood as an everyday practice that permeates the ways in which teachers and students interact in the classroom, build relationships, address conflict, and promote well-being. These findings are consistent with Galtung's perspective (1969, 1996), as they demonstrate a shift beyond a purely negative conception of peace. Indeed, many teachers define peace not merely as the absence of war or conflict, but as the presence of respect, listening, dialogue, empathy, justice, coexistence, and responsibility. This understanding is also consistent with Patel (2022), who argues that living together harmoniously requires the integration of intrapersonal, interpersonal, and social dimensions. Furthermore, the centrality attributed to everyday experience confirms Montanari's (2023) argument that peace education, particularly in early childhood and primary education, cannot be reduced to an occasional intervention but must become an ordinary educational practice embedded in routines, language, relationships, and the everyday management of school life. From this perspective, peace emerges as a lived educational culture rather than as content that is merely transmitted. Particularly noteworthy is the role attributed to conflict. Several responses indicate that teachers do not interpret conflict solely as a problem to be resolved, but rather as an inherent aspect of relational life. This finding is consistent with the work of Lederach (1997, 2005) and Hakvoort et al. (2018), who argue that the ways in which teachers understand conflict directly influence the educational strategies they adopt. When conflict is interpreted as an opportunity for learning, dialogical and transformative possibilities emerge; conversely, when it is perceived as a threat to order or authority, containment-oriented or punitive responses tend to prevail. In this regard, Schön's (1983, 1987) work provides a useful framework for interpreting the findings through the lens of teachers' reflective professionalism. Indeed, educating for peace requires the capacity for reflection-in-action**:** teachers must be able to interpret educational situations, recognize the complexity of emotional and relational dynamics, critically examine their own responses, and select educational practices that are consistent with a nonviolent perspective. Teachers' professional representations therefore become a decisive component of their professionalism, as they shape the ways in which they interpret relationships, conflict, discipline, and coexistence. Overall, the interpretative model that emerges may be summarized as a conception of peace education as educational, intersubjective, and social reciprocity. At the core of this model lies the dimension of reciprocity: individuals contribute to the construction of peace through respect, responsibility, listening, care, and mediation; at the same time, this participation generates a formative return for the individuals themselves, expressed in terms of serenity, well-being, inner growth, and the attribution of meaning to their own experience. Surrounding this core is a methodological and practical dimension**,** consisting of practices such as dialogue, mediation, education for choice, the cultivation of thinking, the collaborative construction of solutions, and the nonviolent management of conflict.

Table 1
Analytical Levels and Interpretative Themes Emerging From the Data Analysis: From In Vivo Coding to Theme Development

Representative Quotation	Lexical Family (In Vivo Coding)	Category	Theme
"Fundamental and indispensable."	Educational necessity	Need/Necessity	**Peace as a primary educational need or necessity**
"Peace education is a form of everyday education that is reflected in the way we relate to students, colleagues, and all members of the school staff."	Educational necessity	Need/Necessity	**Peace as a primary educational need or necessity**
"Educating each individual to be at peace with themselves and with others."	Inner awareness and self-understanding	Individual	**Peace as an intrapersonal dimension of the individual**
"Peace education is the ability to manage one's positive and negative emotions in order to respect oneself and those around us."	Inner awareness and self-understanding	Individual	**Peace as an intrapersonal dimension of the individual**
"Educating for peace means educating my students about the importance of serenity and peace of mind."	Affective and emotional education	Process	**Peace as an educational process**
"A continuous process aimed at developing a culture of peace through the acquisition of knowledge, skills, and attitudes."	Education and educational process	Process	**Peace as an educational process**
"Educating for peace means teaching and learning how to deal consciously with disagreement and the inherently human conflicts of life."	Dialogue, listening, and mediation	Process	**Peace as an educational process**
"A cross-curricular educational pathway aimed at improving listening to others' perspectives, dialogue, communication, and mutual respect."	Dialogue, listening, and mediation	Process	**Peace as an educational process**
"Peace education is the ability to live together without hurting one another—neither with our hands, nor with our words, nor with our ideas."	Coexistence and relationships	Social	**Peace as an intersubjective and social dimension**
"Educating for peace means providing the tools to make this world a better place for ourselves and for all living beings."	Coexistence and relationships	Social	**Peace as an intersubjective and social dimension**
"Educating for peace means promoting respect for others, embracing what is different from us, and engaging in dialogue to find common ground."	Respect and recognition of the other	Social	**Peace as an intersubjective and social dimension**
"Educating individuals to take responsibility for creating environments in which everyone feels respected and free."	Respect and recognition of the other	Social	**Peace as an intersubjective and social dimension**
"A commitment to building a climate that fosters peace, sharing, and acts of kindness, where collaboration replaces competition."	Inclusion, collaboration, and cooperation	Social	**Peace as an intersubjective and social dimension**
"Educating people to resolve conflicts without seeking confrontation, but by constructing solutions that satisfy everyone."	Inclusion, collaboration, and cooperation	Social	**Peace as an intersubjective and social dimension**
"Peace education is education for coexistence, justice, and respect for life in all its forms."	Justice and nonviolence	Social	**Peace as an intersubjective and social dimension**
"There can be no peace without justice and without rights. Educating means fostering constructive dialogue, not teaching people to bow their heads in order to avoid controversy."	Justice and nonviolence	Social	**Peace as an intersubjective and social dimension**
"Peace education could be described as a glimpse of hope for a better world, especially in these times."	Peace as an ideal and value-oriented horizon	Ideal	**Peace as an ideal and value-oriented horizon**
"Peace is harmony, music, and colours."	Peace as an ideal and value-oriented horizon	Ideal	**Peace as an ideal and value-oriented horizon**

Conclusions

Overall, the findings indicate that the teachers who participated in this study conceptualize peace education as an everyday, relational, and multidimensional educational process. Indeed, the definitions collected reveal a conception of peace that integrates educational need, personal development, social-emotional competencies, democratic coexistence, and the nonviolent transformation of relationships. From this perspective, peace emerges as a pervasive practice of school life, embedded in language, behaviours, approaches to conflict management, and the

construction of a positive classroom climate. From a theoretical and pedagogical standpoint, the study reinforces the idea that teachers' professional representations constitute a crucial dimension for understanding how peace education is conceptualized and translated into educational practice. The findings show that the ways in which teachers define peace also implicitly shape the ways in which they interpret conflict, build educational relationships, and attribute meaning to coexistence. Consequently, peace education should not be regarded as an additional or peripheral curricular topic but rather as a cross-cutting dimension of teachers' professional practice. In this regard, the findings highlight the need to strengthen both initial teacher education and continuing professional development in the areas of peace education, constructive conflict management, and social-emotional competencies. As demonstrated by Buchori et al. (2021) and Diazgranados et al. (2014), the capacity to promote peace within educational contexts cannot be taken for granted but requires intentional, reflective, and experiential learning pathways. From a constructive and forward-looking perspective, the data further suggest that teachers' discourse and professional representations already provide fertile ground upon which more systematic and informed educational practices can be developed. Nevertheless, the study presents several limitations, which may also be considered opportunities for future research. First, the sample should be expanded in order to provide a broader and more comprehensive representation of the Italian teaching population. Accordingly, the present study should primarily be understood as an exploratory and interpretative investigation aimed at identifying the meanings, representations, and ways in which teachers conceptualize peace education within school contexts. Furthermore, the findings from this initial phase of analysis reveal two distinct levels of participants' responses: a definitional level, characterized by concise formulations and vocabulary strongly oriented toward value-based meanings, reflecting the semantic status attributed to peace education; and a descriptive level, in which responses assume a more narrative form, structured around pedagogical, relational, and experiential meanings. It is particularly within this latter level that potential tensions begin to emerge between the theoretical definitions attributed to peace education and the ways in which teachers describe the management of conflict and relational dynamics within the classroom. This aspect, which may also be interpreted in light of potential social desirability dynamics, nevertheless requires further investigation, which will be undertaken in the subsequent stages of the research. At the same time, the reflective process activated through the questionnaire also provided the participating teachers with an opportunity to develop greater professional awareness of their own educational practices. In line with Schön's (1983) concept of the reflective practitioner, the study encouraged participants to critically reflect on their approaches to conflict management, their relational practices, and the meanings they attribute to peace in everyday school life. Within this framework, professional reflexivity may also be interpreted in relation to Bandura's (2001) concept of agency, understood as the individual's capacity to critically interpret their own educational practice and to consciously (re)orient it within complex and dynamic contexts.

Third, the present contribution reports the findings from the first phase of the analysis, focusing on teachers' definitions of peace education, whereas the dimensions concerning classroom climate and conflict management will be examined in greater depth in subsequent stages of the research. The analytical process was accompanied by an inter-coding phase conducted by the researchers through moments of reflective discussion, collaborative dialogue, and interpretative negotiation of the emerging codes. Consistent with the methodological literature on qualitative research, inter-coding was not conceived as a procedure aimed merely at mechanically verifying coding agreement. Rather, it was understood as a dialogical and reflective practice intended to refine the internal coherence of the analytical categories, deepen the interpretation of the data, and strengthen the interpretative credibility of the analysis.

Furthermore, this process made it possible to value the intersubjective dimension that characterizes qualitative inquiry, whereby dialogue among researchers contributes to the shared construction of interpretation (Cardano, 2020; Creswell & Poth, 2018; Miles et al., 2020; Mortari, 2007; Saldaña, 2021). The findings provide several promising directions for further investigation into the relationship between teachers' professional representations, educational practices, and conflict management within school contexts. In particular, the evidence gathered may offer useful insights for identifying specific professional development needs related to peace education, the construction of a positive relational climate, and the promotion of dialogical practices in everyday school life. Building on these premises, future developments of this research may contribute to the design of professional development programmes for teachers aimed at fostering reflective and transformative processes capable of strengthening teachers' educational agency in managing relationships and conflicts. Such a perspective is grounded in a conception of education understood not as the passive transmission of knowledge, but as a critical and generative practice that promotes awareness, participation, and shared responsibility.

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

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) to improve the linguistic quality of the English text, to support the translation of the original manuscript into academic English, and to assist with stylistic revision. The AI tool was used exclusively for language editing and writing support and did not contribute to the conceptualization of the study, the interpretation of the findings, or the scientific conclusions. The authors carefully reviewed and edited all AI-assisted outputs and assume full responsibility for the final content of the manuscript.

References

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*(1), 1–26. https://doi.org/10.1146/annurev.psych.52.1.1

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health, 11*(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806

Braun, V., & Clarke, V. (2021). *Thematic analysis: A practical guide*. SAGE.

Braun, V., & Clarke, V. (2022). Conceptual and design thinking for thematic analysis. *Qualitative Psychology, 9*(1), 3–26. https://doi.org/10.1037/qup0000196

Buchori, S., Kartadinata, S., Yusuf, S., Ilfiandra, I., Fakhri, N., & Adiputra, S. (2021). Developing a framework peace education for primary school teachers in Indonesia. *International Journal of Learning, Teaching and Educational Research, 20*(8), 227–239. https://doi.org/10.26803/ijlter.20.8.14

Cardano, M. (2020). *La ricerca qualitativa* [Qualitative research] (2nd ed.). Il Mulino.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. Macmillan.

Dewey, J. (1938). *Experience and education*. Collier Books.

Diazgranados, S., Noonan, J., Brion-Meisels, S., Saldarriaga, L., Daza, B. C., Chávez, M., & Antonellis, I. (2014). Transformative peace education with teachers: Lessons from *Juegos de Paz* in rural Colombia. *Journal of Peace Education, 11*(2), 150–161. https://doi.org/10.1080/17400201.2014.898627

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Freire, P. (1970). *Pedagogy of the oppressed*. Continuum.

Freire, P. (1996). *Pedagogy of freedom: Ethics, democracy, and civic courage*. Rowman & Littlefield.

Galtung, J. (1969). Violence, peace, and peace research. *Journal of Peace Research, 6*(3), 167–191. https://doi.org/10.1177/002234336900600301

Galtung, J. (1990). Cultural violence. *Journal of Peace Research, 27*(3), 291–305. https://doi.org/10.1177/0022343390027003005

Galtung, J. (2019). *Affrontare il conflitto. Trascendere e trasformare* [Facing conflict: Transcending and transforming conflicts]. Pisa University Press.

Guetta, S. (2024). Raccomandazione UNESCO 2023. Un approccio transdisciplinare all'educazione alla pace che coinvolge anche i giovani [UNESCO Recommendation 2023. A transdisciplinary approach to peace education involving young people]. *Studi sulla Formazione, 27*(2), 119–129. https://doi.org/10.36253/ssf-15761

Hakvoort, I., Larsson, K., & Lundström, A. (2020). Teachers' understandings of emerging conflicts. *Scandinavian Journal of Educational Research, 64*(1), 37–51. https://doi.org/10.1080/00313831.2018.1484800

Jullien, F. (2026). *Sciogliere: Filosofia pratica della mediazione* [Untying: A practical philosophy of mediation] (V. Salvati, Trad.). Vita e Pensiero.

Lederach, J. P. (1997). *Building peace: Sustainable reconciliation in divided societies*. United States Institute of Peace Press.

Lederach, J. P. (2005). *The moral imagination: The art and soul of building peace*. Oxford University Press.

López, V., Ortiz, S., Ceardi, A., & González, L. (2022). Exclusionary discipline practices and their relation to Chilean students' perception of school climate practices. *Aggressive Behavior*. https://doi.org/10.1002/ab.22034

Miles, M. B., Huberman, A. M., & Saldaña, J. (2020). *Qualitative data analysis: A methods sourcebook* (4th ed.). SAGE.

Montanari, M. (2023). Promoting peace education as an inclusive prevention practice in Kindergarten and Primary school. *Form@re – Open Journal per la Formazione in Rete, 23*(3), 229–241. https://doi.org/10.36253/form-15084

Mortari, L. (2007). *Cultura della ricerca e pedagogia: Prospettive epistemologiche* [Research culture and pedagogy: Epistemological perspectives]. Carocci.

O'Driscoll, D., Taylor, L. K., & Dautel, J. B. (2021). Essentialist beliefs affect children's outgroup empathy, attitudes and prosocial behaviours in a setting of intergroup conflict. *International Journal of Psychology, 56*(2), 1–10. https://doi.org/10.1002/ijop.12679

Patel, J. (2022). Learning to live together harmoniously: A conceptual framework. *Cambridge Journal of Education, 52*(3), 327–347. https://doi.org/10.1080/0305764X.2021.1993791

Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed.). SAGE.

Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). SAGE.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.

Schön, D. A. (1987). *Educating the reflective practitioner*. Jossey-Bass.

Taylor, L. K., O'Driscoll, D., Dautel, J. B., & McKeown, S. (2020). Empathy to action. *Social Development, 29*, 461–477.

Taylor, L. K., Tomašić Humer, J., & Dautel, J. B. (2022). Predictors of out-group empathy among majority and minority children in a conflict-affected society. *Children & Society, 36*, 949–967. https://doi.org/10.1111/chso.12549

UNESCO. (1974). *Recommendation concerning education for international understanding, co-operation and peace and education relating to human rights and fundamental freedoms*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000063063

UNESCO. (2023). *Recommendation on education for peace, human rights and sustainable development*. UNESCO.

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Full Circle Learning: Making Personalized, Self-Directed, and Community-Based Educational Practices Visible Through Educational Ecosystems

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Abstract

This paper presents an exploratory approach to reconstructing and visualizing individual *Educational Ecosystems* based on qualitative document analysis. The empirical data consist of *Full Circle Learning* (FCL) records produced by students enrolled in the Off-Campus Program of Clonlara School, an accredited private K–12 school in the United States. These records document self-directed educational projects throughout their entire development and provide detailed insights into learning processes that unfold beyond curriculum-based educational settings. Using Grounded Theory Methodology, individual *Educational Ecosystems* are reconstructed and visualized as infographics. The resulting representations reveal the spatial, social, material, and digital dimensions of self-directed educational processes, as well as the roles, practices, relationships, and teleoaffective structures that shape them. As an initial exploratory contribution to an ongoing multi-year research project, the study demonstrates how qualitative learning documentation can be used to make complex educational processes visible. The findings contribute to a broader understanding of education beyond institutional and curricular frameworks and provide a methodological approach that may support the scientific description, societal recognition, and educational legitimacy of self-directed educational processes.

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Introduction

Over the past decades, the conditions under which people learn have changed fundamentally. Alongside curriculum-based educational institutions, learners today have access to a wide range of opportunities to acquire knowledge, skills, and competencies through self-directed learning. Digital learning platforms, tutorials, language-learning applications, online communities, and freely accessible knowledge resources enable educational processes that take place independently of formal curricula and institutional educational pathways. Learning increasingly occurs across diverse social, spatial, and digital contexts and is therefore far less confined to educational institutions than it was only a few decades ago.

Against this background, educational research has increasingly embraced broader conceptions of learning. Rather than viewing education exclusively as an institutional process, contemporary perspectives understand learning as the result of a complex interplay of individual, social, spatial, and material conditions. An important theoretical contribution to this perspective is Norman Jackson's concept of *Learning Ecologies* (Jackson, 2019). Jackson conceptualizes learning as a dynamic process emerging from the interaction of people, places, relationships, resources, practices, and technologies. His approach shifts attention away from learning outcomes alone and instead emphasizes the conditions under which learning emerges and the ways in which different contexts shape educational processes.

Building on this perspective, the present study further develops the concept for the analysis of individual educational processes. The concept of *Educational Ecosystems* serves as an analytical framework for reconstructing self-directed learning as a relational network of people, places, artefacts, practices, and digital environments. Accordingly, the focus lies not solely on learning outcomes or competencies but on the relationships among the elements that constitute an individual educational process.

There is growing recognition that competencies developed outside formal educational settings often remain difficult to make visible and are therefore only partially acknowledged or connected to existing educational and societal structures. Although people develop extensive knowledge, skills, and expertise in a wide variety of contexts, appropriate methods for systematically describing and understanding these learning processes are still largely lacking. Therefore, a substantial part of contemporary educational reality remains invisible. At the same time, valuable knowledge, experiences, and competencies may not be fully integrated into social learning, innovation, and development processes. Making such learning processes visible is therefore not only a prerequisite for scientific analysis but also for recognizing and making better use of the potential represented by diverse educational biographies.

The question of how competencies acquired outside formal educational institutions can be made visible and recognized has also become an important issue in educational policy. Within the Erasmus+ programm, for example, the European Commission promotes the documentation and recognition of non-formal and informal learning through instruments such as the *Youthpass*. Such initiatives primarily focus on documenting and validating the outcomes of learning processes. The present study, however, addresses a preceding question: How can the learning processes themselves be reconstructed and made visible from which these competencies emerge? From the perspective of *Educational Ecosystems*, the primary focus therefore shifts from competencies themselves to the social, spatial, material, and digital conditions, as well as the practices and relationships through which learning beyond institutional and curricular structures becomes possible. Making these complex educational

processes visible creates opportunities not only for their scientific investigation but also for increasing their societal relevance and recognition.

The present paper addresses these questions through a qualitative document analysis of the *Full Circle Learning Documents* (FCLs) produced within the Clonlara School. Using an illustrative case study, it demonstrates how an individual *Educational Ecosystem* can be reconstructed and visualized from these learning records. The visualization is not understood as the endpoint of the analysis but rather as a methodological approach for making complex self-directed educational processes visible. Such visualizations may contribute to the scientific description and long-term societal recognition of self-directed educational processes.

Research Context

The empirical basis of this study consists of the *Full Circle Learning* (FCLs) documents produced by high school students participating in the internationally operating Off-Campus Program of the Clonlara School. Founded in 1967, Clonlara School is an accredited K–12 institution headquartered in Ann Arbor, Michigan (USA), and currently serves approximately 2300 learners worldwide. Within its Off-Campus Program, students design and pursue individualized educational pathways based on their own interests, questions, and learning goals. The *Full Circle Learning* approach enables these self-directed educational activities to be systematically documented and formally recognized within the school's educational framework. The resulting learning records accompany research and educational projects throughout their entire development and therefore provide an exceptionally rich source of qualitative data for reconstructing individual educational processes.

Data and Methodology

The *Full Circle Learning* framework structures each project into ten consecutive steps that guide the entire inquiry and learning process without prescribing either the content, the learning pathway, or the methods to be employed. Rather, it provides a flexible framework within which learners independently plan, conduct, document, and reflect upon their educational activities.

The first phase focuses on project planning. Learners begin by selecting a *Topic* that emerges from their own interests, questions, or goals. This phase also includes a *Pre-Search*, an exploratory stage during which learners investigate different possibilities and gradually narrow their focus. For example, a learner might initially compare different sports before deciding to undertake a project on surfing. This is followed by the *Research* stage, during which learners gather the specific information, materials, and resources required for their chosen project. Based on this preparation, they develop a *Proposal* describing their intended project and identify a mentor who will accompany and support them throughout the learning process.

The second phase consists of a single step: *Fieldwork*. During this stage, learners carry out the activities they have planned. Because both the topics and the methods are determined entirely by the learners themselves, educational activities may take place across a wide range of social, spatial, and material contexts. It is precisely this openness that makes the documents particularly valuable for the present study.

The third phase focuses on reflection. Learners compile a *Portfolio* documenting their work, record any *Presentations* or public sharing of their results, write a concise *Summary* of the project, and conclude with a reflective evaluation of both the learning process and its outcomes.

In addition, the mentor selected by the learner provides an independent *Reflection* on the project.

Figure 1
The Ten Steps of Full Circle Learning Framework (Clonlara School)

Taken together, the ten steps document far more than completed projects. They make the entire developmental process of self-directed education transparent and provide detailed insights into the conditions, practices, relationships, and contexts in which educational processes emerge beyond curriculum-driven learning. It is precisely this process-oriented nature of the documents that makes them a particularly valuable source of data for reconstructing individual *Educational Ecosystems.*

Methodologically, this study is based on qualitative document analysis. The FCL documents were not produced for research purposes but are created as part of the regular educational documentation within the Clonlara School Off-Campus Program. As naturally occurring educational records, they provide an authentic account of self-directed educational processes. The analysis follows the principles of *Grounded Theory Methodology* (Glaser & Strauss, 1967) and is guided by the procedures of open, axial, and selective coding. The present paper reports the findings of an initial exploratory case study conducted within a multi-year research project.

Reconstructing an Individual Educational Ecosystem: The Case of Cleo

Following the description of the data source, an exemplary reconstruction of an individual *Educational Ecosystem* was undertaken. For this purpose, three *Full Circle Learning Records* produced by one student (pseudonym: Cleo) were analyzed. The selected learning projects (*Japanese*, *Physical Fitness*, and *Music)* provide insights into self-directed educational activities across different subject areas and illustrate the diversity of contexts in which self-directed learning can unfold.

The analysis began with a descriptive reconstruction of the elements involved in Cleo's educational processes. These included the places where learning occurred, the people involved, the materials and media used, and the recurring practices and activities documented in the learning records. These elements were subsequently integrated into an infographic representing her individual *Educational Ecosystem*.

The analysis demonstrates that Cleo's educational processes are not confined to a single learning environment. Instead, they unfold across a network of diverse physical, social, and digital spaces. The physical learning environments include the family home, a church as a site of musical practice, a homeschool co-op, and various public spaces. These are complemented by digital learning environments, including video platforms, online learning resources, and other digital tools that support research, practice, and the further development of knowledge and skills.

The range of people involved in the learning process is equally diverse. Family members, mentors, members of the homeschool community, and digital sources of knowledge all contribute to Cleo's educational experiences in different ways. The analysis demonstrates that learning does not occur in isolation but emerges through the interaction of places, people, artefacts, practices, and social relationships.

The resulting visualization (Figure 2) makes these relationships visible. Rather than providing a complete representation of the educational process, it serves as an analytical tool for illustrating the complexity of self-directed educational processes. Its scientific value lies not merely in documenting learning environments or the people involved, but in reconstructing the relationships among the various elements. It is these relational connections that transform a collection of individual places, people, resources, and activities into an *Educational Ecosystem.* Consequently, the visualization illustrates not only where learning takes place but also how different contexts, people, materials, and practices interact to give rise to complex educational processes.

Figure 2

Reconstruction of Cleo's Educational Ecosystem (Japanese, Physical Fitness, and Music)

Beyond illustrating the structural elements of the ecosystem, the visualization also provides insight into the dynamics of the educational processes. This becomes particularly evident in the reconstructed *bundles of practices*, understood in terms of Schatzki's practice theory (Schatzki, 2002). These bundles reveal how different activities, roles, and forms of action are intertwined within a single educational process.

Interpreting the Educational Ecosystem

The *Music* bundle of practices illustrates that Cleo assumes multiple roles throughout her educational process. She receives music instruction while simultaneously sharing her knowledge with others, performs publicly in concerts, and undertakes organizational activities such as creating playlists and organizing her sheet music. Musical learning therefore extends far beyond the acquisition of instrumental skills. It integrates learning, teaching, performing, and organizing into a coherent bundle of practices in which different competencies complement and reinforce one another.

A similar inter-weaving of practices can be observed in other projects. In *Japanese*, Cleo combines self-directed digital learning with social interaction by using the Duolingo app and participating regularly in online conversations with a learning partner. In *Physical Fitness*, individual sporting activities are complemented by communal practices. The homeschool co-op functions not only as a learning environment but also provides opportunities for competitions and shared athletic experiences. Consequently, the *Educational Ecosystem* does not consist of isolated educational activities but of a network of interconnected bundles of practices.

Following Schatzki (2002), these bundles of practices are held together by teleoaffective structures. The learning records reveal a range of affective orientations that give direction and meaning to the educational processes. These include curiosity, intrinsic motivation, the joy of discovery, the desire to present one's achievements publicly and share them with others, and—particularly within the *Physical Fitness* project—a strong competitive spirit. Rather than representing merely individual characteristics of the learner, these orientations emerge through the interaction of the social, spatial, and material conditions that constitute the respective *Educational Ecosystem*.

Digital environments play a particularly significant role within this ecosystem. Rather than constituting a separate component, they permeate almost all educational activities. Digital media support research, communication, practice, collaboration with other learners, documentation, and the organization of learning processes. In doing so, they connect different places, people, and practices, functioning as an integrative element that links the various components of the *Educational Ecosystem*.

The visualization therefore serves not merely to illustrate an individual case but represents a methodological approach for reconstructing and analyzing complex self-directed educational processes. It provides a systematic means of describing *Educational Ecosystems* and of making visible forms of education that develop beyond curriculum-based educational settings and have therefore remained largely invisible within educational research and broader societal discussions.

Conclusion

The analysis of the *Full Circle Learning Documents* and their visual reconstruction as *Educational Ecosystems* make it possible to reveal the complexity and interconnectedness of self-directed educational processes that unfold beyond school-based and curriculum-driven learning structures.

The visualization is not intended as an endpoint but rather as an initial methodological step toward reconstructing such educational processes. A deeper understanding of their spatial, social, material, and digital interrelationships may contribute to the development of further approaches that enable the knowledge, skills, and competencies emerging from these educational processes to be described more effectively, made more visible, and, in the long term, become more readily connected to both society and educational research.

The present case study should be understood as the first exploratory component of a long-term research project.

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

ChatGPT (OpenAI) was used to support the translation of the manuscript from German into English and to improve linguistic clarity. The AI was not used to generate the research design, analysis, findings, or conclusions. The author reviewed and edited all AI-assisted output and takes full responsibility for the content of the manuscript.

References

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine Publishing Company.

Jackson, N. J. (2019). From learning ecologies to ecologies for creative practice. In R. Barnett & N. J. Jackson (Eds.), *Ecologies for Learning and Practice: Emerging Ideas, Sightings, and Possibilities* (pp. 177–192). Routledge. https://doi.org/10.4324/9781351020268-12

Schatzki, T. R. (2002). *The site of the social: A philosophical account of the constitution of social life and change*. Pennsylvania State University Press.

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A Systematic Review of Studies on the Education of Gifted Individuals in the Field of Visual Ability: A Bibliometric Analysis

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Abstract

Gifted individuals-those with exceptional academic, artistic, social, or leadership potential-represent an important resource for societies. The processes of revealing and developing the potential of gifted individuals in the field of visual arts require the systematic support of multidimensional skills such as creative production, aesthetic judgment, and visual-spatial thinking. However, the literature lacks a comprehensive overview showing general research trends on visual-arts gifted education, which countries and scholars lead this work, and how researchers connect through collaboration, co-citation, or interdisciplinary approaches. Mapping the existing body of research is therefore necessary to inform future programs and studies. Based on this rationale, the aim of this study is to examine studies on the education of gifted individuals in the field of visual arts using the bibliometric analysis method. In line with this objective, a search was conducted in the Web of Science (WoS) database using the keywords "gifted", "art", "craft", "visual ability", "education", "train*", "develop*", and a total of 19 keywords derived from these words. Articles in English were included. The research's review process began in January 2026 and ended in June 2026, with a total of 439 publications included in the analysis. Content analysis and bibliometric analysis were employed in the analysis of the collected data. The study examined the distribution of publications by year, identified the most prolific authors, the most frequently published journals, and the countries involved. It is believed that the study contributes to the literature by presenting the results of co-author, co-citation, and co-keyword analyses in visual maps, revealing current focuses and research gaps.

Keywords: gifted, visual ability, talent development, bibliometric analysis

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Introduction

Throughout history, gifted individuals have made significant contributions to the world's development thanks to their extraordinary potential in various fields (Uğulu, 2020). Today, giftedness is understood not merely as a one-dimensional concept of superior intelligence, but as a multidimensional construct that can manifest itself in cognitive, artistic and leadership domains (Clark, 2002). Renzulli (2011), one of the leading researchers in the field of giftedness, provided one of the earliest definitions of the multidimensional nature of giftedness. Accordingly, giftedness is defined as the interaction of three fundamental human characteristics: above-average general ability, a high level of commitment to a task, and a high level of creativity; gifted individuals are defined as those who possess these three characteristics, are able to develop them, and can apply them in any field that holds potential value for humanity (Renzulli, 2011). In Turkey, in line with this multidimensional definition, gifted individuals are defined in the Regulation on Special Education Services as those who learn more quickly than their peers, excel in creativity, the arts and leadership, possess special academic ability, are able to understand abstract ideas, enjoy acting independently in their areas of interest, and demonstrate a high level of performance (Ministry of National Education [MEB], 2018).

Within this multidimensional framework, the domain of visual ability stands out. Visual-spatial ability, defined as the capacity to generate, store and transform visual images (Lohman, 1994), is regarded as a cognitive component closely linked to both artistic productivity and, in particular, academic engagement and success in science and engineering fields (Aldhorman, 2025; Andersen, 2014; Xie et al., 2020). Gifted individuals in the visual arts demonstrate exceptional manual dexterity and motor control, the ability to generate independent ideas and evaluate situations from multiple perspectives, outstanding talent in one or more areas of the visual arts, high leadership potential (Boland, 1986), high motivation to produce original ideas or innovations, problem-solving skills (Cukierkorn, 2007; cited in Genç, 2017), advanced drawing skills, and high levels of concentration and memory (Genç, 2016). Conversely, visual-spatial ability lags behind verbal and numerical abilities in giftedness identification processes, a situation which leads to students with visual talents being overlooked (Andersen, 2014; Budakova et al., 2021; Lakin & Wai, 2020). Given that investment in the education of gifted individuals is considered to contribute directly to a country's development, the importance of this gap in the field of visual ability is thought to be all the more evident.

However, although research in the literature on the education of gifted individuals in the field of visual arts has been conducted in a scattered manner across different disciplines and periods, no comprehensive study has been found that systematically evaluates this body of work. It is considered essential to present a comprehensive overview of the existing literature in order to guide the development of programmes and future research into the education of these individuals. Bibliometric analysis is a powerful method that enables the intellectual structure of a research field, its leading authors and its thematic focuses to be revealed from a holistic perspective (Donthu et al., 2021). Within this framework, the aim of the study has been defined as the examination of research on the education of gifted individuals in the field of visual arts using bibliometric analysis. In line with this objective, the following questions were addressed:

1. How are studies on the education of gifted individuals in the field of visual arts distributed by year?

2. How are studies on the education of gifted individuals in the field of visual arts distributed by country?
3. How are studies on the education of gifted individuals in the field of visual arts distributed by journal?
4. How are studies on the education of gifted individuals in the field of visual arts distributed by author?
5. How are studies on the education of gifted individuals in the field of visual arts distributed by inter-author collaboration?
6. How are studies on the education of gifted individuals in the field of visual arts distributed by country and co-authors?
7. What is the distribution of research on the education of gifted individuals in the field of visual arts, based on the common keywords used?
8. What is the distribution of research on the education of gifted individuals in the field of visual arts, based on co-cited references?

Method

Research Model

Bibliometric analysis is a quantitative content analysis method that uses visual maps to reveal the interconnections between publications, authors or cited sources within a field (Zupic & Čater, 2015). This method enables the visualisation of general trends, author collaborations, citation networks and research patterns within any field. As the aim of this study was to examine publications relating to the education of gifted individuals in the field of visual arts, the bibliometric analysis method was chosen.

Database and Process

The Web of Science (WoS) Core Collection database was utilised during the data collection phase of the study. The searches began in January 2026, with the final search carried out in June 2026. The search was conducted using the following search string in the Subject (TS) field:

> (gifted OR talented OR “high ability”) AND (“art” OR “craft” OR “visual art” OR “visual ability*” OR “visual-spatial” OR “visuospatial”) AND (develop* OR cultivat* OR enhancement* OR improve* OR train* OR program* OR intervention* OR instruction* OR curriculum OR education*) NOT (embryo* OR oocyte* OR zygote* OR gamete* OR “reproductive technology” OR “assisted reproduction” OR IVF OR “in vitro fertilization”)

The search string consists of 19 keywords that bring together concepts relating to exceptional ability (gifted, talented, high ability), visual/artistic terms (art, craft, visual art, visual ability, visual-spatial, visuospatial) and terms relating to educational intervention (develop, cultivate, train, programme, intervention, instruction, curriculum, education). Derivatives of the relevant words have also been included by using the wildcard character (*). During the development of the search string, it was found that the wildcard “art*” also covered publications relating to reproductive technology (e.g. assisted reproductive technology) and the field of medicine; consequently, the search was repeated with the “NOT” operator added, and the medical terms in question were excluded from the scope.

The inclusion criteria for the study were defined as follows: (1) being indexed in the WoS Core Collection database, (2) being published as an article or a review article, (3) being published in English.

The exclusion criteria are as follows: (1) studies involving medical or reproductive technology, (2) publications other than articles or reviews (book chapters, conference papers, editorial material, etc.), (3) publications in languages other than English, (4) early-access publications that have not yet been published in full text.

The initial screening yielded 800 records. Publications relating to medical or reproductive technology were excluded using the "NOT" operator (n = 47), reducing the number of records to 753. Following the exclusion of documents other than articles and reviews (n = 125), the number of records was reduced to 628; and following the removal of non-English publications (n = 161), the number was further reduced to 467. In the final stage, early-access publications, book chapters and conference papers (n = 28) were excluded from the scope, and the total number of publications to be included in the analysis was determined to be 439.

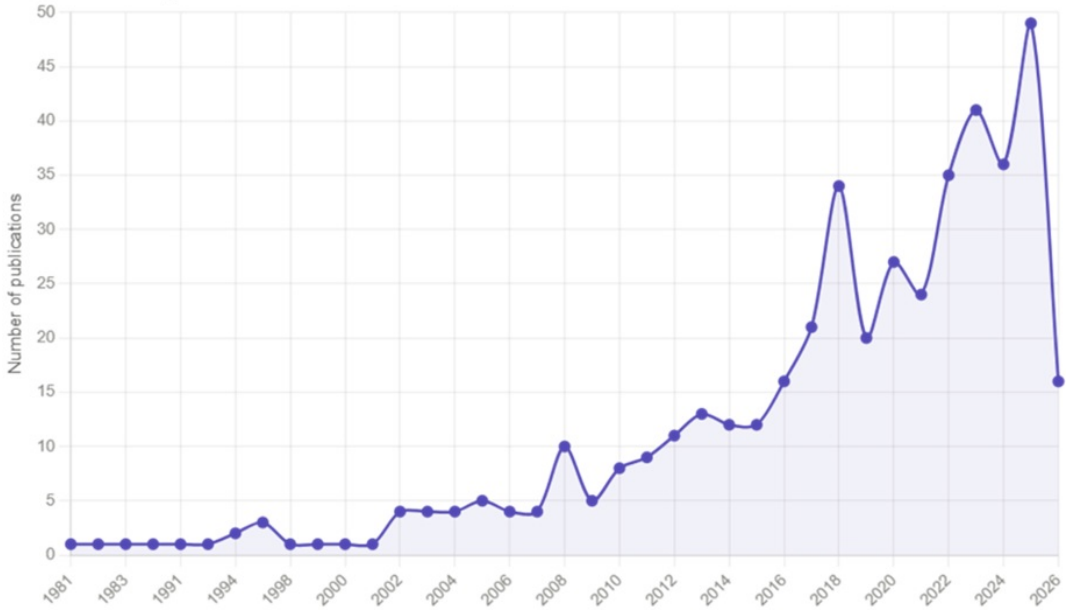
Data Analysis

The study utilised bibliometric and descriptive content analysis in the analysis of the data. During the analysis process, the Web of Science (WoS) platform's built-in "Analyse Results" tool was used. The distribution of studies by year, the countries with the highest number of publications, the journals with the highest number of publications, and the authors with the highest number of publications were included in the content analysis process. The data in the study were also analysed using the VOSviewer 1.6.20 programme. This programme was used to conduct co-citation analysis, co-word analysis and co-author analysis of the relevant studies.

Findings

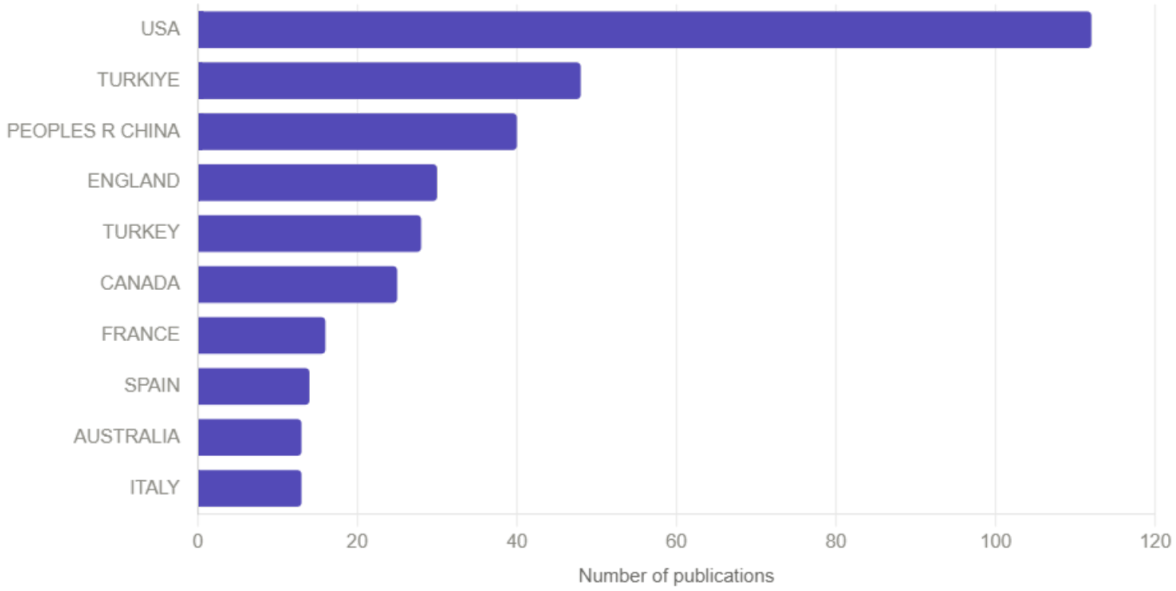
A search of the Web of Science Core Collection database, combined with the inclusion and exclusion criteria applied, yielded a total of 439 studies. It was found that the relevant publications were produced between 1981 and 2026 and across more than 70 countries. This section presents the findings regarding the distribution of these studies by year, country, author and journal, as well as analyses of co-authorship, co-citation and shared terms, organised by heading.

Figure 1
Distribution by Year



Following an analysis of the data obtained, the distribution of publications relating to the education of gifted individuals in the field of visual arts by year is presented in Figure 1. According to this, it can be seen that publications in this field date back to 1981, although the annual number of publications remained fairly limited until 2008. It is noteworthy that a marked upward trend began in 2008, with this increase gaining momentum after 2016. The highest number of publications was reached in 2025, when the year took first place with 49 publications. This was followed by 2023 with 41 publications, 2024 with 36, and 2022 with 35. As of June 2026, the number of publications stands at 16. Overall, it can be said that publications from the last ten years account for approximately two-thirds of the total number of publications, and that the field is attracting growing interest.

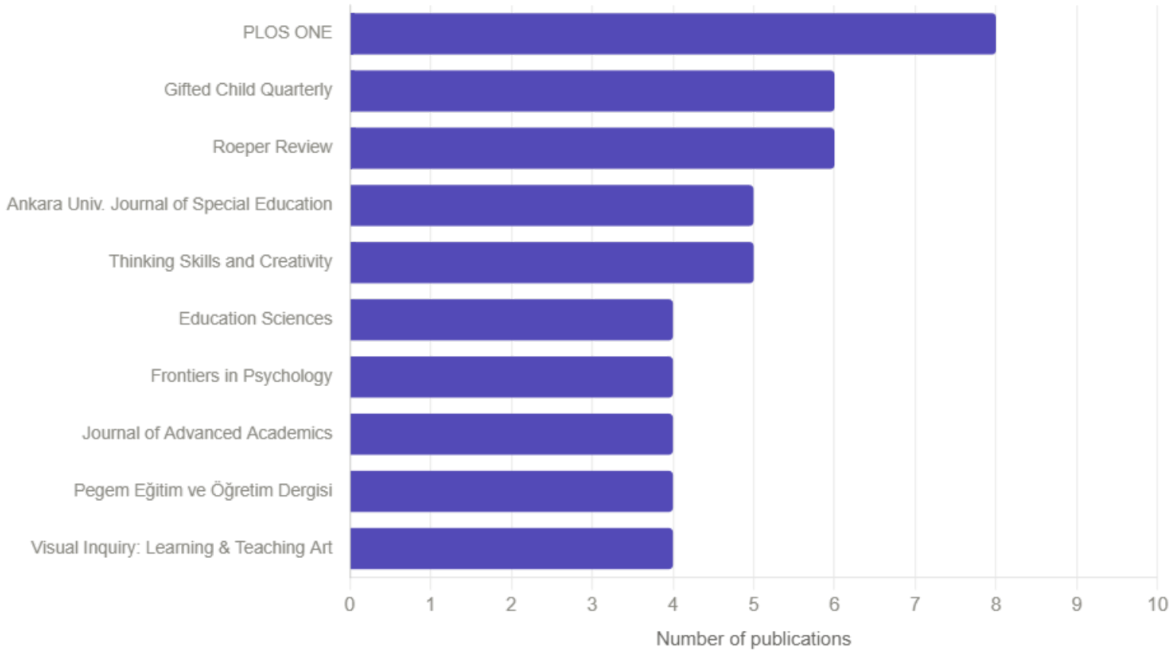
Figure 2
Distribution of Publications by Country



When examining the distribution of publications on the education of gifted individuals in the field of visual arts by country, it can be seen that the United States ranks first with 112 publications. It is followed by the People's Republic of China (n = 40), the United Kingdom (n = 30) and Canada (n = 25). Turkey, however, appears as two separate entries in the WoS system due to differences in naming conventions: "Turkiye" (n = 48) and "Turkey" (n = 28); when these two records are combined, it is seen that Turkey effectively ranks second after the United States with a total of 76 publications. In addition to these, researchers from over 70 countries, including Russia, India, Germany, Saudi Arabia, Ukraine, Poland, South Korea, the Netherlands, South Africa and Taiwan, have contributed to this field. The distribution of the top ten countries by number of publications is presented in Figure 2.

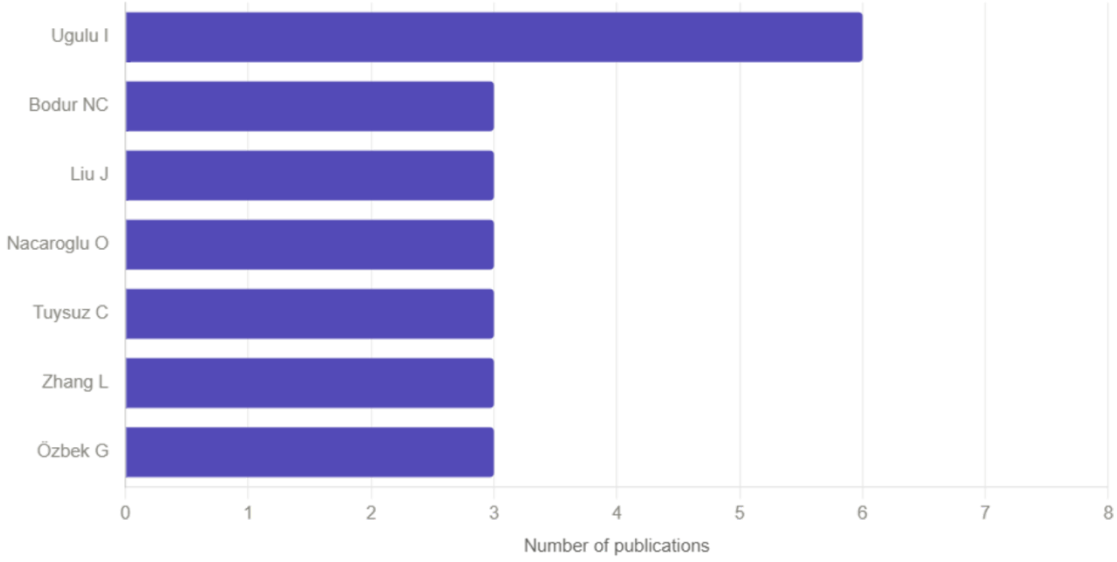
Figure 3

Distribution of Journals by Number of Issues



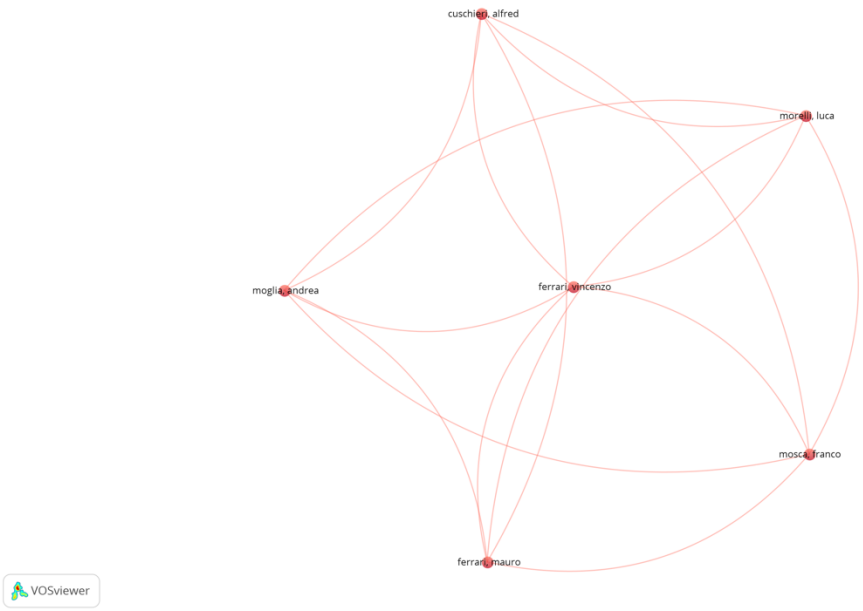
When examining the journals in which publications on the education of gifted individuals in the field of visual arts are concentrated, it is evident that 439 publications are spread across more than 300 different journals, and that the number of publications in any single journal remains relatively limited. The journal with the highest number of publications was PLOS ONE, with 8. This was followed by *Gifted Child Quarterly* and *Roeper Review: A Journal on Gifted Education*, each with 6 publications. Tied for fourth place, with 5 publications each, were the *Journal of Special Education* published by the Faculty of Educational Sciences at Ankara University and *Thinking Skills and Creativity*. There are four publications each in *Education Sciences*, *Frontiers in Psychology*, *Journal of Advanced Academics*, *Pegem Journal of Education and Teaching* and *Visual Inquiry: Learning & Teaching Art*. The fact that leading journals in the field of giftedness, such as *Gifted Child Quarterly* and *Roeper Review*, feature in the top ranks indicates that research in this field is also concentrated in relevant specialist journals. The relevant distribution is presented in Figure 3.

Figure 4
Distribution of Authors by Number of Publications



When examining the distribution of publications on the education of gifted individuals in the field of visual arts by author, it is seen that the most prolific author is Ugulu I, with six publications. This is followed by Bodur NC, Liu J, Nacaroglu O, Tuysuz C, Zhang L and Özbek G, each with three publications. Among the most prolific authors are M. Csikszentmihalyi and E. Winner-two established figures in the field of giftedness and creativity-each with two publications. Looking at the overall picture, it is evident that research in this field is spread across a broad range of authors. The distribution of the most prolific authors is presented in Figure 4.

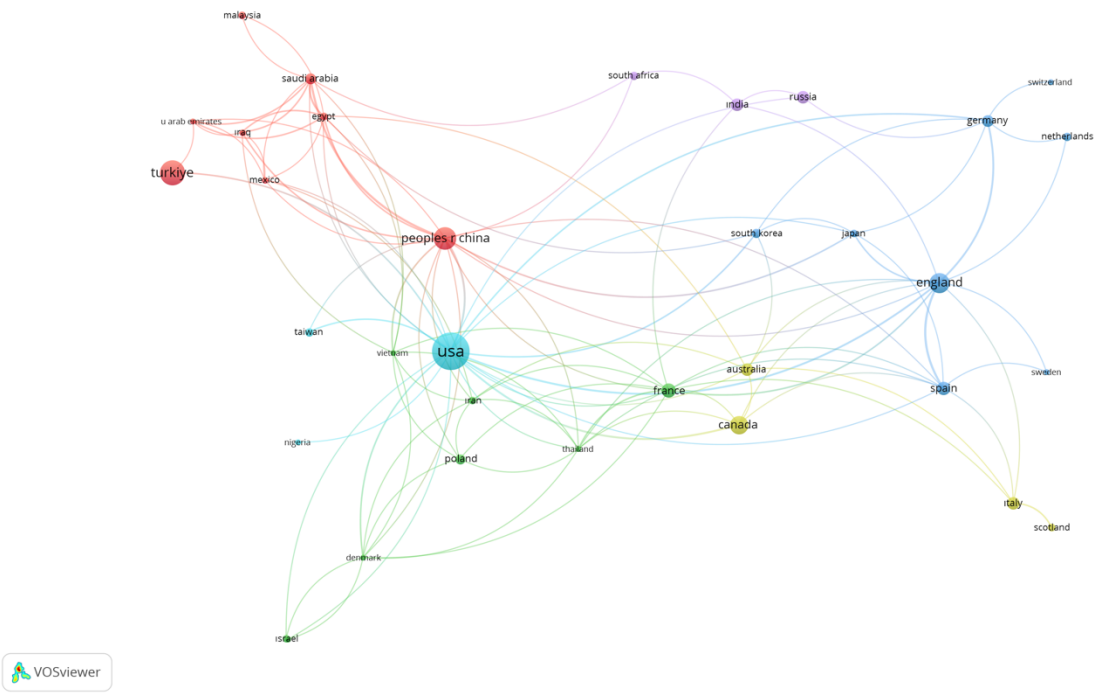
Figure 5
Authors' Collaboration Network



The analysis was carried out in VOSviewer by setting a minimum threshold of two publications as part of the co-authorship analysis. It was observed that all six authors meeting

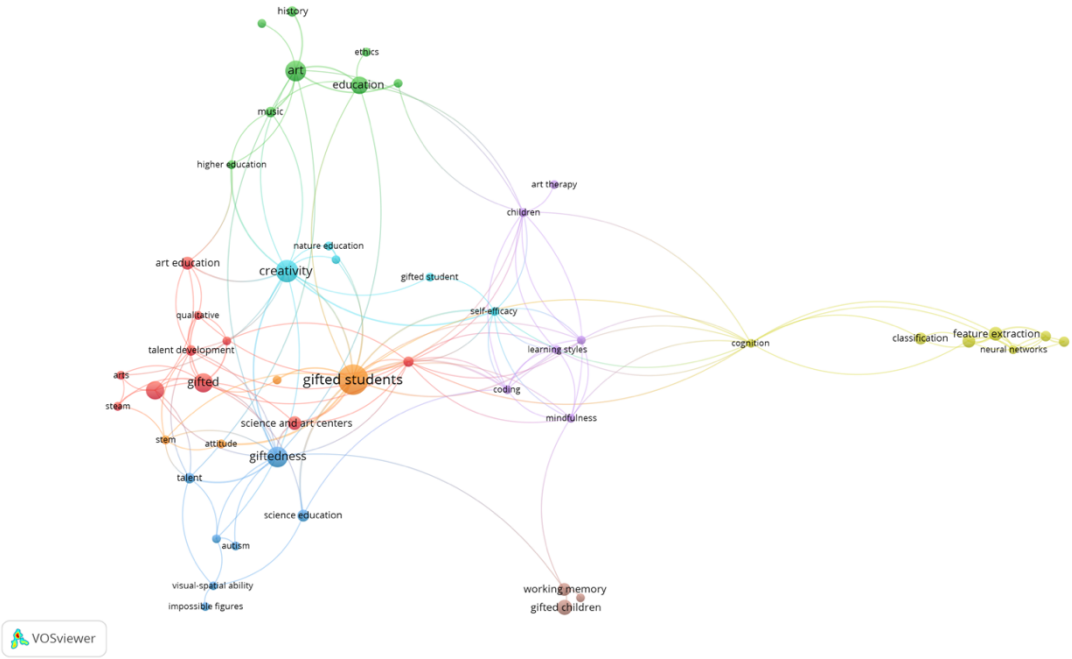
this criterion formed a single interconnected cluster. This cluster comprises Cuschieri A, Ferrari M, Ferrari V, Moglia A, Morelli L and Mosca F. Upon examination of the network map, it is notable that all authors are directly connected to one another and exhibit a closed group structure rather than a broad collaboration network. It was found that these authors, who met the threshold of at least two publications, did not form a meaningful collaboration network directly related to the field. This finding suggests that collaboration between authors in research on the education of highly gifted individuals in the field of visual arts is still in its early stages. The relevant network map is presented in Figure 5.

Figure 6
Network of Co-authors by Country



As part of the co-author analysis by country, a minimum criterion of three publications was applied, and it was found that the 37 countries meeting this criterion formed six distinct clusters. An examination of Figure 6 reveals that the United States (n = 108) is situated at the centre of the network as the largest node and is the country with the highest level of international collaboration. The People's Republic of China (n = 40), meanwhile, forms the red cluster alongside Turkey, Egypt, Saudi Arabia, Malaysia, Iraq and the United Arab Emirates. The United Kingdom (n = 30) is situated in the blue cluster alongside Germany, Spain, South Korea, Japan, the Netherlands and Switzerland, forming the focal point of the Europe-centred collaboration network. France, Poland, Denmark, Thailand, Vietnam, Iran and Israel form the green cluster; Australia, Canada and Italy form the yellow cluster; Russia, India and South Africa form the purple cluster; whilst the USA, Nigeria and Taiwan form the turquoise cluster. The relevant network map is presented in Figure 6.

Figure 7
Shared Keyword Network

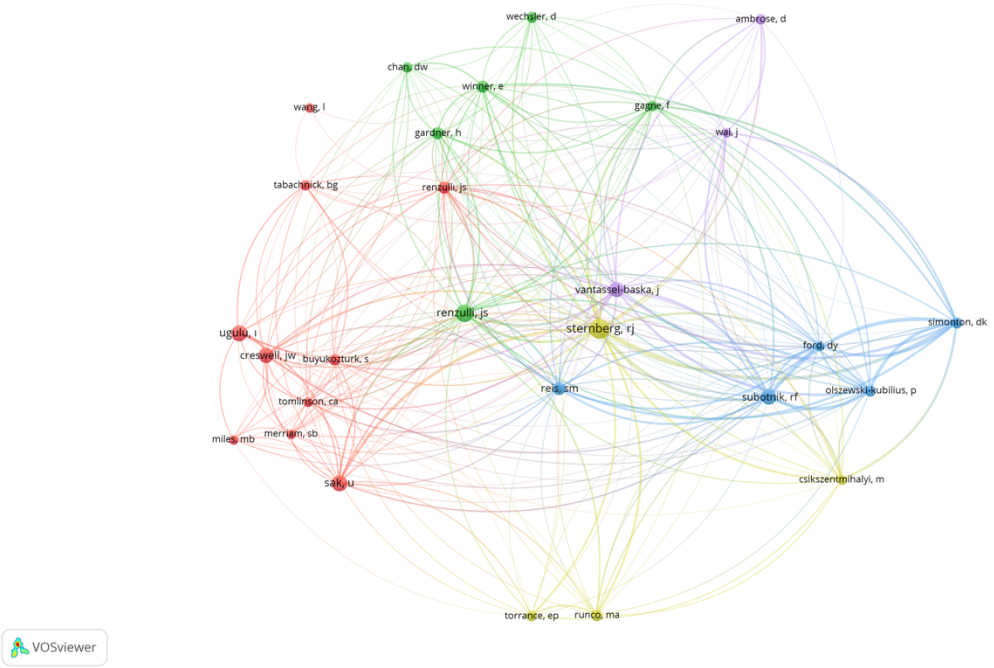


As part of the co-occurrence analysis based on author keywords, a minimum of three repetitions was set as the criterion, and it was observed that the 50 keywords meeting this criterion formed eight distinct clusters. Upon examining Figure 7, it is notable that the term "gifted students" is situated at the centre of the network with the highest frequency of occurrence (n = 33) and is connected to almost all clusters. This clearly demonstrates that gifted students form the focal point of research in this field.

In the red cluster, the concepts of "gifted", "gifted education", "art education", "talent development", "STEAM" and "qualitative" are found together. This cluster represents research centred on educational programmes for gifted individuals and art education. In the blue cluster, the terms "giftedness", "talent", "autism", "science education", "visual-spatial ability" and "impossible figures" are grouped together; it is evident that this cluster focuses on the identification of giftedness and visual-spatial skills. The green cluster comprises the concepts of "art", "education", "music", "history" and "ethics", reflecting studies centred on art history and cultural contexts. In the orange cluster, the terms "creativity", "nature education" and "creative thinking" stand out, indicating that this cluster encompasses research on creativity and nature-based education. The purple cluster contains the concepts "art therapy", "children" and "coding", whilst the pink cluster includes the terms "self-efficacy", "learning styles" and "mindfulness"; it is noteworthy that these clusters are shaped around art therapy and individual learning characteristics, respectively.

In the yellow cluster, terms such as "cognition", "classification", "feature extraction", "neural networks", "deep learning", "optimization" and "training" are grouped together; it is understood that this cluster represents studies focusing on artificial intelligence and deep learning applications. Finally, in the light pink cluster, the concepts of "gifted children", "working memory" and "visuospatial ability" appear together, and it is evident that this cluster reflects research examining the relationship between cognitive abilities and giftedness. The relevant network map is presented in Figure 7.

Figure 8
Co Citation Network



As part of the co-citation analysis, a minimum citation threshold of 15 was applied, and it was observed that the 27 authors meeting this criterion formed five distinct clusters. An examination of Figure 8 reveals that Sternberg RJ, with the highest number of citations (n = 66), is situated at the centre of the network and is connected to all clusters. Sternberg RJ's central position indicates that his work on theories of intelligence and creativity is used as a fundamental reference by numerous studies in the field.

The red cluster includes Sak U (n = 43), Renzulli JS (n = 25), Büyüköztürk S, Creswell JW, Merriam SB, Miles MB, Tabachnick BG, Ugulu I and Wang L. The fact that this cluster consists predominantly of Turkish researchers and qualitative researchers indicates that studies originating from Turkey are clustered around a specific methodological framework within the literature. The green cluster comprises Gardner H, Winner E, Chan DW, Wechsler D and Gagne F; this cluster appears to focus on the topics of multiple intelligences, visual abilities and the assessment of giftedness. The blue cluster comprises Subotnik RF (n = 37), Reis SM (n = 26), Olszewski-Kubilius P, Ford DY and Simonton DK; it is understood that this cluster consists of researchers working on the development of gifted individuals and educational programmes. The fact that the blue cluster is situated close to the centre of the network indicates that these researchers have established broad connections across different fields of study. The yellow cluster comprises Csikszentmihalyi M, Runco MA and Torrance EP, and it is evident that this cluster is shaped around theories of creativity. Finally, the purple cluster comprises VanTassel-Baska J, Wai J and Ambrose D, and it is evident that this cluster is centred on curriculum development for gifted individuals and subject-specific talent research. The relevant network map is presented in Figure 8.

Discussion

The findings obtained from the bibliometric analysis of 439 publications on the education of gifted individuals in the field of visual arts reveal significant insights regarding the historical

development, geographical distribution, intellectual structure and thematic patterns of the field.

It can be seen that the publications span the period from 1981 to 2026, although they remained fairly limited until 2008, with approximately two-thirds of the total publications having been produced in the last decade. This finding indicates that research interest in the field of visual ability has increased significantly in recent years. This increase runs parallel to growing awareness of the importance of visual-spatial ability in STEM fields and its neglect in the education of gifted pupils (Andersen, 2014; Budakova et al., 2021). Indeed, Andersen (2014) emphasises that visual-spatial ability has been overlooked in identification processes for decades and that the research gap in this area has only begun to be addressed in recent years. Kamal (2026) also demonstrates in his study that the general bibliometric pattern in the field of gifted education has shown a similar acceleration, reaching a record number of publications in 2021 due to the post-pandemic effect, before returning to a stable level of output. The fact that 2025 saw the highest number of publications to date indicates that interest in the field remains current and continues to grow.

The fact that the US ranks first with 112 publications can be attributed to its long-standing research tradition and institutional infrastructure in the field of gifted education. Indeed, it is thought that the fact that key theorists in the field of giftedness, such as Renzulli (2011), are of US origin has contributed to this theoretical body of work and systematic research tradition. This finding is consistent with the general bibliometrics of gifted education reported by Kamal (2026) and Cristina et al. (2025). This indicates that the US's leadership is not specific to the field of visual arts but represents a pattern that extends across the field as a whole. It is a notable finding that, when the entries "Turkiye" (n = 48) and "Turkey" (n = 28) are combined, Turkey effectively ranks second with 76 publications. This can be explained by the fact that institutional structures in Turkey, such as BİLSEM, encourage research into the education of gifted individuals in the visual arts (Daşdemir, 2025).

The fact that 439 publications are spread across more than 300 different journals clearly reflects the interdisciplinary nature of the field. The fact that PLOS ONE (n = 8) was the journal with the highest number of publications indicates that research in the field of visual ability is moving towards an interdisciplinary and open-access-oriented structure. The presence of leading journals in the field of giftedness, such as *Gifted Child Quarterly* and *Roeper Review*, among the top rankings demonstrates that this research is also finding a place in relevant specialist journals. Kamal (2026) also found that *Gifted Child Quarterly* is the most cited journal in the general literature on gifted education, a finding that confirms the journal's pivotal position in the field. Hernández-Torrano and Kuzhabekova (2020), in their study examining four key journals on giftedness (Gifted Child Quarterly, Roeper Review, High Ability Studies, Journal for the Education of the Gifted) between 1957 and 2017, determined that *Gifted Child Quarterly* and *Roeper Review* accounted for approximately 80 per cent of total publications. This finding demonstrates that the central position of these journals in the field has been established over many years.

It can be seen that the author with the most publications is Ugulu I, with six, but that, overall, the number of publications by any single author remains quite limited and that research in the field is spread across a broad group of authors. This finding suggests the existence of a polyphonic and dispersed structure rather than the dominance of a specific group of researchers in the field. The inclusion on the list of established figures in the field of

creativity and artistic talent, such as Csikszentmihalyi M and Winner E, can be interpreted as an indication that their foundational theoretical contributions continue to shape the field.

An analysis of co-authorship among authors revealed that the six authors who met the minimum threshold of two publications did not form a meaningful collaboration network directly related to the field. This finding suggests that collaboration among authors in research on the education of gifted individuals in the field of visual arts is still in its early stages. This pattern is consistent with the general trend in the field of gifted education: Kamal (2026) demonstrated that the vast majority of studies in this field are carried out by individual teams and that the proportion of international co-authors remains quite limited. Similarly, Hernández-Torrano and Kuzhabekova (2020) found that researchers in the field largely work in geographical isolation and that US researchers collaborate almost exclusively with colleagues within their own country.

An analysis of co-authorship by country reveals that 37 countries form six distinct clusters, with the US at the centre of the network. This finding highlights the US's dominant position in the field, not only in terms of the number of publications but also in terms of international research collaboration. Jolly et al. (2024) have shown that collaborative links between certain countries in the field of gifted education are structured through doctoral training processes and long-term academic relationships; this suggests that these collaborative networks are not random but are rooted in historical and institutional foundations. The fact that the People's Republic of China is grouped alongside countries such as Turkey, Egypt and Saudi Arabia suggests that the geographical and cultural affinities between these nations facilitate cooperation. The fact that the United Kingdom forms the focal point of a Europe-centred cooperation network, meanwhile, suggests that research collaboration in Europe has a relatively mature structure.

The fact that the term "gifted students" occupies the centre of the network with the highest frequency of occurrence indicates that gifted students form the focal point of research in this field. The fact that terms such as "visual-spatial ability" and "visuospatial ability" appear together in the blue cluster suggests that research into the identification and assessment of visual-spatial ability constitutes a distinct thematic focus within the field. The emphasis placed by Andersen (2014) and Budakova et al. (2021) on the need for visual-spatial ability to be systematically measured in diagnostic processes supports this interpretation. In their bibliometric analysis of STEM/STEAM education for gifted pupils, Kaymakçı and Can (2023) identified spatial ability, creativity, specialised schools, enrichment and gender differences as among the most frequently addressed concepts in the field. This finding confirms that visual-spatial ability constitutes a central theme in research on the education of gifted individuals within the STEM context. The presence of the yellow cluster, which focuses on artificial intelligence and deep learning applications, indicates that research in this field is increasingly intersecting with technological developments.

The fact that Sternberg RJ occupies the centre of the network with the highest number of citations (n = 66) indicates that his work on theories of intelligence and creativity is used as a key reference by much of the research in the field. The fact that leading figures in the field of gifted education, such as Renzulli JS, Subotnik RF and Reis SM, are situated in different clusters indicates that the field is based on a multi-layered theoretical foundation. This pattern is consistent with the co-citation analysis conducted by Kamal (2026) in the general literature on gifted education. In the study in question, Sternberg, Gardner and Renzulli were also identified as central nodes linking multiple research communities simultaneously. The

clustering of Turkish researchers and qualitative research methodologists within the same cluster suggests that studies originating from Turkey are shaped around a specific methodological framework.

When the findings are assessed as a whole, it is evident that research into the education of gifted individuals in the field of visual arts has gained momentum over the past decade, spanning a wide geographical area, yet has not yet reached maturity in terms of international collaboration. The interdisciplinary nature of the field is clearly evident in the thematic clusters that have emerged at the intersection of various disciplines, such as art education, cognitive psychology, educational sciences and technology. Tay and Zhang (2026) demonstrated that this interdisciplinary structure takes different forms in different national contexts; they showed that approaches focused on technical mastery predominate in China, whilst those centred on creative expression and conceptual thinking prevail in the US, and highlighted that neither system is able to provide equal opportunities for gifted art students due to socio-economic inequalities and differences in cultural capital. Baccassino and Pinnelli (2023) emphasise that research in the field of gifted education is predominantly conducted by researchers from the discipline of psychology, and that the field's "citation culture" prioritises English-language publications and US-based studies, thereby limiting the visibility of contributions from other regions and disciplines. This suggests that the geographical and institutional concentration observed in the present study may reflect a broader structural trend that is not specific to this field. It is considered that visual-spatial ability requires systematic support in both its identification and development processes (Andersen, 2014; Budakova et al., 2021), and that educational programmes in this field must be approached in an integrated manner, incorporating support from the family, school and peers (Aldhorman, 2025; Daşdemir, 2025). Consequently, this research serves as a guiding resource for future research and educational programmes by providing a comprehensive overview of the current body of knowledge in this field.

Conclusion

In this study, 439 publications relating to the education of gifted individuals in the field of visual arts were analysed using bibliometric methods; the historical development, geographical distribution, intellectual structure and thematic patterns of the field were systematically identified. When the findings are evaluated as a whole, it is evident that research output in the field of visual arts has accelerated significantly since 2008, although it remains concentrated geographically and institutionally around specific countries and groups of researchers. It is evident that the USA holds a dominant position in the field, both in terms of the number of publications and international collaboration networks. The publication pattern, spanning over 300 different journals, clearly reflects the field's interdisciplinary nature; thematic clusters emerging at the intersection of diverse fields such as art education, cognitive psychology, educational sciences and technology make this multidimensional structure visible. In the joint citation analysis, the central position of Sternberg RJ, alongside the inclusion of Gardner H and Winner E in the same cluster, reveals that the field possesses a multi-layered theoretical framework grounded in theories of visual ability and multiple intelligences. The fact that collaboration networks between authors have not yet matured, however, points to a significant need for the development of research capacity within the field.

In light of the research findings, the following recommendations have been developed:

- Given that international collaboration networks in this field are not sufficiently

developed, initiatives by researchers to bridge this gap through multi-country joint projects and comparative studies could be supported. Furthermore, given the interdisciplinary nature of the field of visual arts, integrated research models involving researchers from different disciplines working together could be developed.

- With regard to future research, it is evident that limiting this study solely to the Web of Science database and excluding publications in languages other than English-particularly those in Turkish-constitutes a significant limitation. Future studies that include additional databases such as Scopus and ERIC will provide a more comprehensive picture of the literature.
- Furthermore, given the quantitative nature of the bibliometric analysis conducted in this study, systematic review studies that examine the qualitative dimensions of research patterns in the field in depth could be carried out.

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

The author declares that DeepL, an AI-assisted language tool, was used during the preparation of this manuscript for translation and language refinement purposes. The use of DeepL was limited to improving linguistic accuracy, readability, and clarity. All ideas, analyses, interpretations, and conclusions presented in this manuscript are the author's own.

References

Aldhorman, G. A. A. (2025). The relationship between artistic skills and academic engagement among artistically gifted non-specialist university students. *PLOS One, 20*(9), e0329483. https://doi.org/10.1371/journal.pone.0329483

Andersen, L. (2014). Visual–spatial ability: Important in STEM, ignored in gifted education. *Roeper Review, 36*(2), 114–121. https://doi.org/10.1080/02783193.2014.884198

Baccassino, F., & Pinnelli, S. (2023). Giftedness and gifted education: A systematic literature review. *Frontiers in Education, 7*, 1073007. https://doi.org/10.3389/feduc.2022.1073007

Boland, D. (1986). Artistically talented students: A call for research. *Marilyn Zurmuehlen Working Papers in Art Education, 5*(1), 16–25. https://doi.org/10.17077/2326-7070.1126

Budakova, A. V., Likhanov, M. V., Toivainen, T., Zhurbitskiy, A. V., Sitnikova, E. O., Bezrukova, E. M., & Kovas, Y. (2021). Measuring spatial ability for talent identification, educational assessment, and support: Evidence from adolescents with high achievement in science, arts, and sports. *Psychology in Russia: State of the Art, 14*(2), 59–85. https://doi.org/10.11621/pir.2021.0205

Clark, B. (2002). *Growing up gifted: Developing the potential of children at home and at school.* Prentice Hall.

Cristina, R., Remedios, A. M., Celia, M. C., Begoña, C. R., & Antonio, V. I. (2025). Trends and topics evolution in research on giftedness in education: A Bibliometric Analysis. *Psychology in the Schools, 62*, 3403–3413. https://doi.org/10.1002/pits.23549

Daşdemir, A. (2025). Common backgrounds of students in the field of visual arts at Science and Art Centers (SAC). *Ankara University Faculty of Educational Sciences Journal of Special Education, 26*(1), 17–32. https://doi.org/10.21565/ozelegitimdergisi.1367206

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research, 133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Genç, M. A. (2016). Gifted awareness in the field of visual arts: Identification. *Mehmet Akif Ersoy University Journal of Education Faculty, 1*(38), 152–167.

Genç, M. A. (2017). Comparative analysis of painting abilities of gifted students in visual arts and intellectually gifted students. *Bolu Abant Izzet Baysal University Journal of Faculty of Education, 17*(2), 679–692. https://doi.org/10.17240/aibuefd.2017.17.30227-326592

Hernández-Torrano, D., & Kuzhabekova, A. (2020). The state and development of research in the field of gifted education over 60 years: A bibliometric study of four gifted education journals (1957–2017). *High Ability Studies, 31*(2), 133–155. https://doi.org/10.1080/13598139.2019.1601071

Jolly, J. L., Hodges, J., & Vlaamster, T. (2024). Australian gifted education scholarship: A bibliometric analysis. *High Ability Studies, 35*(2), 135–165. https://doi.org/10.1080/13598139.2024.2341617

Kamal, M. H. (2026). Bibliometric analysis of research on gifted education. *Pertanika Journal of Social Sciences & Humanities, 34*(1), 135–154. https://doi.org/10.47836/pjssh.34.1.07

Kaymakcı, G., & Can, Ş. (2023). Bibliometric analysis of the articles on STEM/STEAM education in gifted students. *International Journal of Turkish Educational Sciences, 11*(21), 275–308. https://doi.org/10.46778/goputeb.1258457

Lakin, J. M., & Wai, J. (2020). Spatially gifted, academically inconvenienced: Spatially talented students experience less academic engagement and more behavioural issues than other talented students. *The British Journal of Educational Psychology, 90*(4), 1015–1038. https://doi.org/10.1111/bjep.12343

Lohman, D. F. (1994). Spatially gifted, verbally, inconvenienced. In N. Colangelo, S. G. Assouline, & D. L Ambroson (Eds.), Talent development: Vol. 2. Proceedings from the 1993 *Henry B. and Jocelyn Wallace National Research Symposium on Talent Development* (pp. 251–264). Ohio Psychology Press.

Millî Eğitim Bakanlığı. (2018). *Özel eğitim hizmetleri yönetmeliği* . Resmî Gazete (Sayı: 30471) [*Regulation on Special Education Services.* Official Gazette (Issue: 30471)]. https://www.resmigazete.gov.tr/eskiler/2018/07/20180707-8.htm

Renzulli, J. S. (2011). What makes giftedness? Reexamining a definition. *Phi Delta Kappan, 92*(8), 81–88. https://doi.org/10.1177/003172171109200821

Tay, J., & Zhang, C. (2026). Serving talented art students: Different cultures, different strokes. *Journal of Advanced Academics, 37*(1), 9–40. https://doi.org/10.1177/1932202X251389230

Ugulu, I. (2020). Gifted students' attitudes towards science. *International Journal of Educational Science, 28*(1-3), 7–14. https://doi.org/10.31901/24566322.2020/28.1-3.1088

Xie, F., Zhang, L., Chen, X., & Xin, Z. (2020). Is spatial ability related to mathematical ability: A meta-analysis. *Educational Psychology Review, 32*(1), 113–155. https://doi.org/10.1007/s10648-019-09496-y

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods, 18*(3), 429–472. https://doi.org/10.1177/1094428114562629

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Zooming In on Engagement: How Synchronous Meet-Ups Strengthen Presence, Belonging, and Learning in Fully Online Higher Education Courses Through Design

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Abstract

This paper explores the role of synchronous Zoom meet-ups in enhancing student engagement in fully online courses. Grounded in the Community of Inquiry framework, the study investigated how real-time video interactions supported social, cognitive, and teaching presence. Data were collected from undergraduate online courses that integrated two required Zoom sessions alongside asynchronous learning activities. Quantitative measures included course performance data and students' ratings of engagement while qualitative insights were drawn from student reflections via survey. Findings indicate that structured Zoom meet-ups fostered increased participation, greater connection with the instructor, and sense of belonging. Students reported that synchronous interactions with the instructor clarified expectations, increased belongingness, and supported deeper understanding of course assessments. However, challenges related to scheduling and additional time needed were reported.

Keywords: online engagement, Zoom meet-ups, presence

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Introduction

Online asynchronous courses offer flexibility and expanded access to higher education; however, maintaining student engagement remains a persistent challenge (Bergdahl, 2022; Hollister et al., 2022; Xia et al., 2022). Students in asynchronous environments often report feelings of isolation, limited interaction with peers and instructors, reduced motivation, and difficulties sustaining active participation in course activities. Recent research suggests that engagement in asynchronous learning is closely linked to the quality of interactions and the learning community established within the course (Deep et al., 2025). That is, when instructors establish clear connections and pathways of communication with students, these same students are more likely to engage with course content, engage with their peers more deeply, and sustain significant involvement in course assessments and goals.

The Community of Inquiry (CoI) framework posits that meaningful educational experiences emerge through the interaction of three interconnected elements: teaching presence, social presence, and cognitive presence (Garrison et al., 2000). Teaching presence refers to elements of course design that facilitate and direct both cognitive and social processes to recognize personally meaningful and educationally worthwhile learning outcomes. Social presence refers to the ability of learners to be able to project themselves as 'real' authentic people who engage in open communication and in establishing meaningful relationships. Finally, cognitive presence refers to the ability of the learner to construct meaning through reflection and critical inquiry. Research has demonstrated that these presences are associated with student learning and engagement in online courses. Consequently, when students experience presence in an online learning environment, they are more like to engage with course activities and establish connections with other course colleagues.

In this study, we explored aspects of these three experiences, by setting up intentional, structured, required Zoom meetings. Incorporating "face-to-face" opportunities within these online courses may encourage and support connection and presence thereby increasing belongingness and engagement. For example, in these meet-ups students have the chance to express themselves meaningfully and actually "show" themselves as real people. They also can reflect and discuss course activities as well as begin to interact with other key course stakeholders (i.e., the course instructor). In this exploratory study, it was anticipated that these synchronous sessions would impact students' feelings around presence. It was expected that students who participated in these meet-ups would report stronger feelings of engagement overall and report that they had opportunities to build a stronger relationship with the course instructor.

Method

This study included 159 undergraduate students (8 males, 151 females) from an urban university, who were asked to engage in two required "meet-ups" throughout a 15-week semester in two upper-division courses within their major. The participants identified as Asian (n = 48), Latino (n = 67), White (n = 26), Multiethnic (n = 8) or Black (n = 4). Other ethnic groups included American Indian, Hawaiian/Pacific Islanders, Other or Preferred not to say (n = 1 for each of these categories). In addition, participants were aged 17–22 (n = 81), 23–26 (n = 37), 27–30 (n = 20), 31–35 (n = 6), 36–40 (n = 9) and 41–60 (n = 6).

Meet-ups consisted of 15–20 minute Zoom sessions, students met in groups of 2–3 students and signed up based on their individual schedules. Meet-ups were structured to include

information regarding course requirements, "getting-to-know-you" questions, and opportunities for students to check-in regarding anything within the course. Students could also request to meet individually with the course instructor. There were two required meet-ups throughout the semester. Typically, the first meet-up was focused on welcoming the student, introducing course requirements, and establishing a connection with the course instructor and course peers. The second meet-up was more likely to be 1:1 sessions, with a sharper focus and purpose on major course assessments and examination questions. Most students engaged in the two required meet-ups (n = 150). 22 students noted that they requested a third meet-up. In addition, 12 students noted that they attended additional office hours beyond the meet-ups.

Students were asked to self-report on their engagement, helpfulness of these meet-ups, and their learning during meet-up sessions (responding to agreement with specific statements) using a five point likert-like scale (reporting on agreement with statements such as "The meet-ups helped me feel engaged with the course" and "I felt comfortable talking with the instructor in the meet-ups"). Students were asked to provide feedback/narrative comments on what they found to be the strengths of these meet-ups and areas of improvement. Overall course grades were also assessed.

Results

After controlling for gender, results indicated a significant positive correlation between students' grades and course engagement ($r = .71$, $p < .01$). No differences were found for ethnicity or age.

Students strongly agreed that they found the meet-ups helpful for understanding course materials, engagement with the course, and connection with the instructor. They also strongly agreed that they learned about additional policies and course information as well as used their time to discuss course requirements (see Table 1). Students reported that they were not intimidated by these meet-up sessions (see Table 2).

Table 1
Self-Reported Agreement With Meet-Up Outcomes

Meet-Up Statement	Strongly Agree	Agree
I found the meet-ups to be helpful for my understanding of the course materials/requirements.	75%	24%
The meet-ups helped me feel engaged with the course.	73%	20%
The meet-ups helped me feel connected with the instructor.	82%	16%
I learned about additional policies or information about the course in the meet-ups.	68%	20%
I learned about the instructor's teaching philosophy and areas of flexibility in these meet-ups.	81%	14%
I used my time in the meet-ups to discuss course requirements.	69%	14%
I felt comfortable in talking with the instructor in the meet-ups.	83%	13%

Table 2
Self-Reported Agreement With Meet-Up Negative Outcomes

Meet-Up Statement	Strongly Agree	Agree
I felt intimidated by the meet-ups.	2%	11%
I did not feel that the meet-ups were helpful in understanding course materials/requirements.	2%	2%

Overall, these findings highlight that students felt presence in these meet-ups and that they self-reported greater engagement as linked to these meet-up sessions.

Reported Strengths of Meet-Ups

When asked to provide narrative feedback about their experiences with these meet-ups students provided robust comments. Across the participants there were 155 individual sets of comments. Using NVIVO, five themes were identified linked to students perceived strengths of these meet-up sessions.

1. *Building Relationships/Connection/ Engagement With Professor*

Students reported on increased social presence as a result of meet-up experiences. Specifically, they noted that these meet-ups provided an opportunity to build a relationship and establish connections with the course instructor. As one example, a student noted that, "I liked that I was able to connect with the professor one-on-one as this course was an asynchronous online class. I liked that we were able to talk about personal and academic topics."

2. *Clarification on Course Concerns*

A second key theme that was found was that the meet-ups provided an opportunity to clarify course concerns (e.g., checking in regarding course elements). An exemplar of these theme included, "the strengths of the meet-ups were providing support to the assignments and touching base with the requirements to each assignment. Very helpful and understanding with course overload."

3. *Asking Questions and Discussing Course Requirements*

A third significant theme that emerged from the narrative comments was the use of these meet-ups as a space to ask specific questions about the course. One student noted specifically that, "the strengths of the meet-ups was allowing students to ask questions, address any concerns, and discuss about class assignments with the instructor."

4. *Provision of Direct Assistance/Individualized Help*

Students throughout the course also noted a need for individualized support (e.g., questions about accessibility, experiencing problems outside of the course). They used the scheduled meet-ups as an opportunity to obtain that support. As one example a student noted that, "I was able to ask my own questions that I had about assignments without feeling intimidated because the professor was the one that encouraged the question asking."

5. Provision of Assignment Feedback

One final theme that emerged as a strength of these meet-ups was how they were utilized as a space to discuss instructor provided feedback on course assessments. One exemplar of this theme was, "some of the strengths was that it allowed me to have a better understanding of the assignments and feedback on them as well."

Reported Improvements of Meet-Ups

Students were also asked for suggestions for improvement for their meet-up experiences and the overall structure of these meet-ups. The responses to this question were not as robust as the responses to the question about meet-up strengths (with many responses noted as N/A or none). That is, 90% of the comments were none or not applicable. Across the participants there were 132 individual sets of comments. Using NVIVO, four themes were identified.

1. Request for Additional Meet-Ups

One common improvement suggestion was the need for more than two required meet-ups. One student noted that, "maybe adding one or two more meet ups to discuss concerns about grades or assignments."

2. More Time to Discuss Course Requirements/Concerns

Students also wanted more structured time to discuss course components. As an example comment, a student stated, "I just wish these meet-ups could be longer, 20 minutes is not enough to really connect with course colleagues! I understand that everyone's busy, which is unfortunate. I also wish the professor could go over the rubrics of assignments."

3. Request for Longer Timeframe of Meet-Ups

Students also wanted more than 15-20 minutes with the course instructor and/or their course peers. As an exemplar a student noted that, "more time, rather than 15 min she should do about 30 min so we can address our concerns."

4. Clarification About Content of Meet-Ups

A final theme was that students wanted more information about the meet-ups before they engaged in them. A student described this theme, "I believe having an announcement on what is going to be discussed in the meet up will help benefit students because they might feel anxious or scared since they don't know what to expect what's going to be talked about in the meet up."

Comments About Structure of Meet-Ups

Across the sets of narrative comments, there was feedback provided about the specific structure of the meet-ups. Meaning that students appreciated that these sessions were not just open question/answer sessions. In other words, there were paced activities within the meet-up so that the full time was utilized. An illustrative comment included, "I think the strengths of the meet-ups were that the professor had an idea of what to talk about during the meet ups, opposed to

simply just having students meet and ask questions. I also like that there were multiple times available, so the Professor was flexible."

Overall, these themes illustrate the robust nature of students' perceptions around the value and import they placed on these synchronous meet-ups.

Conclusions

Findings demonstrate that these meet-ups play an important role in supporting student engagement and connection in asynchronous courses; increasing social and cognitive presence. Students reported connection with both the instructor and other peers and that these meet-ups supported a welcoming climate in their online course experience. Although it was anticipated that students would note the impact of meet-ups on their course learning, the narrative comments provided did not note this impact. The study also highlights the importance of student perceptions of these interactions and understanding of the purpose and organizational structure of these meetings. Overall, the findings suggest that Zoom meet-ups, when thoughtfully designed and structure, can serve as a mechanism for engaging online learners. Implications for practice include balancing structure with interaction, leveraging video presence to humanize instruction, and using synchronous sessions to complement rather than replicate asynchronous content. Future research should examine direct engagement (outside of student perceptions) and assess direct impacts on course grades and learning.

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

The author declares that no AI or AI-assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Bergdahl, N. (2022). Engagement and disengagement in online learning. *Computers & Education*, *188*, 104561.

Deep, P. D., Chen, Y., Ghosh, N., & Rahaman, S. (2025). The influence of student–instructor communication methods on student engagement and motivation in higher education online courses during and after the COVID-19 pandemic. *Education Sciences*, *15*(1), 33. https://doi.org/10.3390/educsci15010033

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2,* 87–105. http://dx.doi.org/10.1016/S1096-7516(00)00016-6

Hollister, B., Nair, P., Hill-Lindsay, S., & Chukoskie, L. (2022). Engagement in online learning: Student attitudes and behavior during COVID-19. *Frontiers in Education*, *7*, 851019. https://dx.doi.org/10.3389/feduc.2022.851019

Xia, Y., Hu, Y., Wu, C., Yang, L., & Lei, M. (2022). Challenges of online learning amid the COVID-19: College students' perspective. *Frontiers in Psychology, 13*, 1037311. https://dx.doi.org/10.3389/fpsyg.2022.1037311

Reducing Barriers to Special Education for Spanish-Speaking Latine Families

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Abstract

Special education serves as a critical framework for ensuring educational access and equity for students with disabilities; however, navigating this system presents significant challenges for many families, particularly Latinx families who are monolingual Spanish speakers. Language barriers, systemic oppression, and power imbalances often limit families' access to information, meaningful participation, and advocacy within special education processes. Grounded in the Diversity, Equity, Inclusion, Intersectionality, Power Analysis, and Anti-racism, this presentation introduces a Spanish-language podcast series designed to increase parental knowledge of special education, procedural rights, and available resources in Colorado. The podcast seeks to reduce linguistic and informational barriers, empower families to advocate for their children, and address inequities rooted in structural and institutional practices. By centering intersectional identities and lived experiences, the project promotes inclusive engagement and challenges dominant power structures that marginalize Latinx families. This intervention not only supports families in navigating special education systems but also provides school districts with a tool to better understand community needs, foster culturally responsive practices, and advance justice-oriented educational reform.

Keywords: special education, Spanish-speaking Latine families, family advocacy, educational equity, parent engagement

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Introduction

Special education provides the legal and educational framework for ensuring that students with disabilities receive a free and appropriate public education (FAPE) through the Individuals with Disabilities Education Act (IDEA). Central to IDEA is the recognition that families are equal members of the educational team and have the right to participate in decisions regarding the identification, evaluation, placement, and services provided to their children. While these legal protections establish an expectation of meaningful family engagement, navigating the special education process remains challenging for many families. These challenges are particularly pronounced for Spanish-speaking Latine families who experience language barriers, limited access to culturally responsive information, and systemic inequities that restrict meaningful participation in educational decision-making (Alba et al., 2022; Burke et al., 2020).

Research consistently demonstrates that language is one of the most significant barriers affecting family participation in special education. Spanish-speaking Latine families report difficulties communicating with educators, understanding educational terminology, accessing documents in their preferred language, and advocating effectively for their children during Individualized Education Program (IEP) meetings (Alba et al., 2022; Liu et al., 2018). Although schools commonly provide interpreters during formal meetings, interpretation alone does not eliminate systemic barriers. Families continue to report feeling disempowered, excluded from decision-making, and uncertain about their procedural rights, resulting in unequal participation despite federal protections (Angell & Solomon, 2017; Burke et al., 2020).

These challenges extend beyond language differences and reflect broader structural inequities embedded within educational systems. Historically, students with disabilities and students from historically marginalized racial and ethnic communities have experienced unequal access to educational opportunities. Although legislation such as IDEA significantly expanded educational rights, disparities continue to exist in referral practices, identification, disciplinary outcomes, and access to services (Colorado Department of Education, 2017; Davila, 2015). These inequities are particularly evident among culturally and linguistically diverse students, who continue to experience both overrepresentation and underrepresentation in special education depending on disability category and local educational practices (Curran & Hulse, 2021).

Research further indicates that many Latine families possess limited knowledge regarding the special education process and their legal rights within IDEA (Burke et al., 2020). Families have described feeling intimidated during IEP meetings because educators are viewed as experts, while parents often lack familiarity with educational terminology, procedures, and available resources (Mortier et al., 2021). This imbalance contributes to unequal power relationships in which families may hesitate to ask questions, challenge recommendations, or advocate for services because they fear negative consequences for their children or feel their voices are not valued (Angell & Solomon, 2017). Consequently, family participation may become procedural rather than collaborative, limiting opportunities to develop educational plans that fully reflect students' strengths, needs, and cultural contexts.

Current supports within school systems primarily focus on providing interpretation during meetings or translating selected documents. While these practices are essential components of equitable service delivery, they often fail to provide families with ongoing access to information outside of school meetings. Families frequently leave meetings with unanswered questions or receive information only at critical decision-making points, limiting opportunities

to build knowledge and confidence over time (Aceves, 2014). Furthermore, traditional parent trainings are often delivered in person, creating additional barriers related to transportation, childcare, work schedules, and scheduling flexibility.

Technology offers an opportunity to expand access to culturally responsive educational resources while reducing many of these barriers. Podcasts provide flexible, asynchronous learning opportunities that allow families to access information in their preferred language regardless of time or location. Unlike traditional workshops, podcast episodes can be revisited multiple times as families encounter different stages of the special education process. This accessibility creates opportunities for continuous learning and empowers families to engage more confidently in educational decision-making.

This paper presents a Spanish-language podcast series designed to increase special education knowledge among Spanish-speaking Latine families in Colorado. Drawing upon the Diversity, Equity, Inclusion, Intersectionality, Power Analysis, and Anti-racism (DEIPAR) framework (Dyer & Gushwa, 2023), Critical Race Theory, and Disability Critical Race Theory, the podcast seeks to reduce linguistic and informational barriers while strengthening family advocacy and participation. By providing accessible, culturally responsive information regarding IDEA, procedural safeguards, special education terminology, and community resources, the podcast serves as an innovative approach to increasing equitable access to information beyond traditional school-based practices. Rather than replacing existing family supports, the podcast complements current services by extending educational opportunities outside formal meetings and promoting stronger partnerships between schools and the Latine communities they serve.

While schools have made important progress in providing language access through interpreters and translated documents, language access enables communication, but knowledge access enables equitable participation. The proposed podcast addresses this gap by providing ongoing, culturally responsive education that empowers Spanish-speaking Latine families to participate as informed partners throughout the special education process.

Literature Review and Problem Statement

Special education is intended to provide equitable educational opportunities for students with disabilities by ensuring access to individualized supports and services. Although federal legislation, including the Individuals with Disabilities Education Act (IDEA), guarantees families the right to participate in educational decision-making, equitable participation remains difficult for many culturally and linguistically diverse families. Research consistently demonstrates that Spanish-speaking Latine families experience systemic barriers that limit meaningful participation in the special education process, resulting in disparities in access, advocacy, and educational outcomes (Alba et al., 2022; Burke et al., 2020).

Language Barriers and Family Participation

One of the most consistent findings throughout the literature is the impact of language barriers on family participation in special education. Spanish-speaking Latine families report difficulty communicating with educators, understanding special education terminology, and navigating the Individualized Education Program (IEP) process (Alba et al., 2022). These barriers often begin during referral and evaluation and continue throughout eligibility determination, annual reviews, and transition planning.

Although IDEA requires schools to provide interpretation and translation services when needed, access to language supports remains inconsistent. Alba et al. (2022) found that Spanish-speaking parents were significantly less likely than English-speaking families to receive educational information and IEP documents in their preferred language. Families also described difficulties asking questions during meetings because they lacked confidence in understanding educational terminology or feared misunderstanding important information.

Communication challenges extend beyond translation. Effective collaboration requires families to understand educational procedures, disability categories, available services, and their legal rights as members of the IEP team. Simply translating documents does not necessarily increase understanding or confidence. Research suggests that families require ongoing opportunities to learn about special education outside of formal meetings to become effective advocates for their children (Aceves, 2014).

Liu et al. (2018) further demonstrated that communication improves when educators themselves are able to communicate in Spanish rather than relying exclusively on interpreters. Families reported feeling more comfortable sharing concerns and participating in discussions when they experienced direct communication with educators. Although bilingual professionals remain limited within many school districts, these findings highlight the importance of culturally responsive communication beyond basic interpretation services.

Power, Advocacy, and Family Empowerment

The literature consistently identifies unequal power relationships between schools and families as another significant barrier to equitable participation. Although IDEA positions parents as equal members of the educational team, many Latine families report feeling intimidated during meetings and perceive educators as the primary decision-makers (Angell & Solomon, 2017).

Parents frequently describe entering meetings without understanding the process, educational terminology, or available options. This lack of information contributes to feelings of disempowerment and decreases confidence in asking questions or disagreeing with school recommendations. Burke et al. (2020) found that Spanish-speaking families reported significantly lower levels of special education knowledge and family empowerment than English-speaking families. Families who understood their rights and the special education process demonstrated greater confidence advocating for appropriate services and participating in educational planning.

Research also highlights that fear influences advocacy. Some families expressed concerns about challenging school personnel because they worried their child might receive fewer services or experience negative treatment (Mortier et al., 2021). Others reported hearing stories from members of their communities regarding discrimination or unsuccessful attempts to advocate for services, creating additional reluctance to participate fully in educational decision-making (Angell & Solomon, 2017).

These experiences illustrate that equitable participation requires more than legal protections. Families must also possess the knowledge, confidence, and resources necessary to exercise those rights effectively. Increasing family knowledge represents one strategy for reducing existing power imbalances while strengthening collaborative partnerships between schools and families.

Systemic Inequities in Special Education

The barriers experienced by Latine families cannot be understood independently of the broader historical and structural inequities that continue to shape special education. Historically, educational systems have reflected systemic racism and ableism that have contributed to unequal access to educational opportunities for students with disabilities and students from historically marginalized communities (Blanchard et al., 2021).

Research has documented longstanding disparities in special education identification, placement, and disciplinary practices. Students of color continue to experience disproportionality in referrals, disability classifications, suspensions, and expulsions (Colorado Department of Education, 2017). Although disproportionality varies across disability categories and geographic regions, these disparities suggest that systemic factors influence educational outcomes beyond individual student characteristics.

Davila (2015) argues that understanding these disparities requires examining educational systems through Critical Race Theory and Disability Critical Race Theory. Rather than viewing educational inequities as isolated incidents, these frameworks recognize that institutional policies and practices often reproduce historical patterns of exclusion. Language differences, cultural assumptions, and implicit bias may all contribute to unequal educational opportunities for culturally and linguistically diverse students.

Curran and Hulse (2021) similarly noted that emergent bilingual students are both overrepresented and underrepresented within special education depending upon disability category. Distinguishing between language acquisition and disability remains a significant challenge for educators, particularly when culturally responsive assessment practices are inconsistent. These findings emphasize the importance of improving communication and family participation throughout evaluation and eligibility determination.

Current Interventions and Remaining Gaps

Several interventions have demonstrated promise in increasing family knowledge and participation. Among the strongest evidence is parent education delivered in families' preferred language. Aceves (2014) developed Spanish-language workshops designed to educate families regarding special education procedures, parental rights, and available community resources. Families who participated reported increased understanding of the IEP process and greater confidence advocating for their children.

Similarly, Luelmo et al. (2021) found that targeted advocacy training improved parents' knowledge of special education while increasing family empowerment. These findings suggest that increasing access to information can strengthen family participation and improve collaboration between schools and families.

Mortier et al. (2021) examined the role of cultural brokers who served as advocates connecting Latine families with educational systems. Families reported that cultural brokers helped explain educational terminology, navigate school procedures, and facilitate communication with educators. These supports reduced feelings of isolation while strengthening trust between families and schools.

Despite these promising interventions, significant gaps remain. Many existing programs rely upon in-person workshops or individual advocacy services that may be difficult for families to access because of work schedules, transportation, childcare responsibilities, or limited availability. Additionally, most interventions occur only after students have entered the special education system rather than providing proactive educational resources before families encounter critical educational decisions.

Research also demonstrates that families often receive information only during formal school meetings. While interpreters facilitate communication during these meetings, families continue to report limited opportunities to build knowledge outside of scheduled educational events. Consequently, many parents enter IEP meetings without sufficient understanding of their rights, educational terminology, or available services.

Another gap identified throughout the literature is the limited availability of culturally responsive educational resources that families can access independently. Although school districts increasingly translate documents, translation alone does not provide the comprehensive education necessary to promote advocacy and long-term family engagement. Accessible resources that families can revisit throughout their child's educational journey remain limited.

Rationale for the Current Project

The existing literature demonstrates that increasing family knowledge improves advocacy, strengthens collaboration, and promotes more equitable participation in special education (Aceves, 2014; Burke et al., 2020). However, few interventions have leveraged technology to provide ongoing, culturally responsive education that families can access at their convenience.

The proposed Spanish-language podcast addresses this gap by providing free, on-demand educational content focused on special education, procedural safeguards, family rights, advocacy strategies, and community resources. Unlike traditional workshops, podcast episodes can be accessed repeatedly from home, during travel, or at any time that is convenient for families. This flexibility reduces barriers related to transportation, scheduling, and childcare while increasing opportunities for continuous learning.

Grounded in the lived experiences described throughout the literature, the proposed podcast addresses a critical gap in current practice. Although schools have made important progress in providing language access through interpreters and translated documents, language access enables communication, but knowledge access enables equitable participation. Families need ongoing, culturally responsive educational resources that extend beyond formal school meetings and support advocacy throughout their child's educational journey. The podcast moves beyond simply translating information by providing culturally responsive education designed specifically for Spanish-speaking Latine families. Rather than positioning families as passive recipients of services, the podcast recognizes them as knowledgeable partners whose participation is essential to student success. By increasing access to information, strengthening family knowledge, and reducing systemic barriers, this project seeks to strengthen family advocacy, improve school-family partnerships, and advance educational equity within special education.

Theoretical Framework

This project is grounded in the Diversity, Equity, Inclusion, Intersectionality, Power Analysis, and Anti-racism (DEIPAR) framework developed by Dyer and Gushwa (2023). DEIPAR provides an equity-centered lens for examining the systemic barriers that influence educational access and participation while recognizing that students and families possess multiple intersecting identities that shape their experiences. For Spanish-speaking Latine families navigating special education, these identities include language, race, ethnicity, disability, socioeconomic status, immigration status, and culture. Understanding these intersecting identities is essential for addressing inequities that extend beyond individual circumstances and are embedded within educational systems.

The diversity component of DEIPAR acknowledges that families bring unique cultural experiences, strengths, and perspectives to the educational process (Dyer & Gushwa, 2023). School districts increasingly serve culturally and linguistically diverse populations, yet educational systems often provide information through practices designed primarily for English-speaking families. This project recognizes diversity by providing educational content in Spanish while acknowledging the lived experiences of Latine families navigating special education. Rather than expecting families to adapt to existing systems, the intervention seeks to increase access through culturally responsive communication.

Equity requires more than equal access to services; it requires providing families with the resources necessary to participate meaningfully in educational decision-making (Dyer & Gushwa, 2023). Although IDEA guarantees procedural rights and schools commonly provide interpreters during meetings, research demonstrates that Spanish-speaking Latine families continue to experience inequitable access to information, report lower levels of special education knowledge, and participate less actively during Individualized Education Program (IEP) meetings (Alba et al., 2022; Burke et al., 2020). The proposed podcast addresses this inequity by providing ongoing educational resources that families can access outside of formal meetings, increasing opportunities to build knowledge before participating in educational decisions.

The DEIPAR framework also emphasizes inclusion by promoting authentic participation rather than symbolic involvement. Families become meaningful partners when they possess the knowledge and confidence necessary to advocate for their children. Providing accessible educational resources in families' preferred language supports collaboration while recognizing that equitable participation requires more than attendance at meetings. It requires understanding the special education process, available services, and procedural safeguards.

Power analysis is another essential component of DEIPAR. Research consistently demonstrates that Spanish-speaking Latine families often perceive educators as the experts while parents feel uncertain about questioning recommendations or advocating for services because of language barriers and unfamiliarity with educational systems (Angell & Solomon, 2017; Mortier et al., 2021). Increasing access to knowledge helps redistribute power by positioning families as informed partners within the IEP process. Rather than relying solely on educators to explain procedures during meetings, families can build understanding independently and participate more confidently in educational decision-making.

This project is further informed by Critical Race Theory (CRT) and its extensions, Latina/o Critical Race Theory (LatCrit) and Disability Critical Race Theory (DisCrit) (Davila, 2015).

These frameworks emphasize that educational inequities are not the result of individual family characteristics but are produced through institutional policies, historical practices, and systemic oppression. LatCrit specifically recognizes how language, immigration, and culture intersect with race to influence the experiences of Latine communities, while DisCrit examines the intersection of race and disability in educational systems. Together, these perspectives encourage educators to examine systemic barriers rather than viewing language differences as deficits within families.

Finally, this project draws upon Adaptive Leadership (Korengel, 2008), which emphasizes innovation, collaboration, and systems change to address persistent challenges. Adaptive leadership encourages educational leaders to move beyond traditional approaches by developing solutions that align with organizational values and community needs. The proposed podcast reflects this approach by leveraging technology to provide accessible, culturally responsive education beyond school walls. Rather than replacing existing services, the intervention complements current practices by expanding opportunities for learning, strengthening family-school partnerships, and advancing educational equity. Collectively, DEIPAR, Critical Race Theory, and Adaptive Leadership provide the theoretical foundation for an intervention that seeks to reduce systemic barriers while empowering Spanish-speaking Latine families to become informed and active participants throughout the special education process.

Equity-Focused Podcast Intervention

The literature consistently demonstrates that increasing family knowledge strengthens advocacy, improves family-school partnerships, and promotes more equitable participation throughout the special education process (Aceves, 2014; Burke et al., 2020). Although school districts have made important progress in improving language access through interpreters and translated documents, language access enables communication, but knowledge access enables equitable participation. The proposed Spanish-language podcast was developed to address this gap by providing accessible, culturally responsive education specifically designed for Spanish-speaking Latine families in Colorado.

The intervention consists of a ten-episode Spanish-language podcast series that provides families with practical information about special education while centering the lived experiences of Latine families. Each approximately 45-minute episode focuses on a different topic relevant to navigating the special education process and is designed to be accessible to families regardless of their work schedules, transportation, childcare responsibilities, or geographic location. Unlike traditional parent workshops that require attendance at a specific time and place, podcast episodes are available on demand, allowing families to engage with information whenever it is most convenient and revisit content throughout their child's educational journey.

The series begins by introducing the history and purpose of special education, including the development of IDEA and the rights afforded to students with disabilities and their families. Understanding the historical context of special education provides families with a foundation for recognizing how educational policies have evolved and why advocacy remains necessary. Additional episodes focus on significant disproportionality within special education, highlighting the persistent racial, ethnic, and linguistic disparities that continue to affect culturally and linguistically diverse students in Colorado and across the United States.

Several episodes are dedicated to helping families understand the special education process from referral through eligibility, evaluation, IEP development, annual reviews, and transition planning. Educational terminology is explained using accessible language while emphasizing procedural safeguards and parental rights under IDEA. Families are provided with practical strategies for preparing for meetings, reviewing evaluation reports, asking questions, requesting additional assessments, and collaborating effectively with school teams. Community resources available within Colorado are also highlighted to increase families' awareness of advocacy organizations, legal resources, and family support services.

A distinguishing feature of the podcast is its emphasis on storytelling and community expertise. Research demonstrates that families often feel isolated while navigating special education and benefit from hearing the experiences of others who have encountered similar challenges (Mortier et al., 2021). The podcast incorporates interviews with bilingual professionals, school social workers, special educators, advocates, and Latine parents who share their experiences navigating educational systems. These conversations provide practical guidance while validating families' lived experiences and reinforcing that they are not alone in encountering barriers.

Unlike interventions that focus solely on translating existing materials, the podcast was designed to build family knowledge. Educational content is intentionally organized to increase confidence and promote meaningful participation throughout the special education process. Families are encouraged to view themselves as equal members of the IEP team whose cultural knowledge and understanding of their child are essential to educational decision-making. By increasing knowledge before formal meetings occur, families are better positioned to ask questions, advocate for services, and collaborate with educators from a position of confidence rather than uncertainty.

The intervention also aligns with culturally responsive practice by recognizing that learning occurs outside of formal educational settings. Families are able to access podcast episodes from home, while commuting, or at times that fit their daily routines. This flexibility addresses barriers frequently identified throughout the literature, including transportation, work schedules, childcare responsibilities, and limited availability of in-person trainings (Aceves, 2014). Because episodes remain available over time, families can revisit information as their child's educational needs change or as they encounter different stages of the special education process.

The podcast also has important implications for educational professionals and school systems. Increasing family knowledge has the potential to strengthen communication, reduce misunderstandings, and create more collaborative IEP meetings. Families who understand educational terminology, evaluation procedures, and procedural safeguards are more prepared to participate as informed partners rather than passive recipients of information. This shift supports educational teams in developing individualized educational plans that more accurately reflect students' strengths, cultural contexts, and family priorities.

Future evaluation of the podcast should examine its effectiveness in increasing family knowledge, confidence, and advocacy. Outcomes such as changes in parental understanding of IDEA, perceptions of empowerment, participation during IEP meetings, and family-school partnerships could provide valuable evidence regarding the effectiveness of technology-based educational interventions. Additional research may also explore implementation across

different school districts and evaluate whether similar approaches could support families from other culturally and linguistically diverse communities.

Ultimately, this project moves beyond translating educational information by creating a culturally responsive resource that promotes knowledge access. While interpreters remain essential for facilitating communication during school meetings, equitable participation requires families to understand the special education process before, during, and after those meetings occur. By combining research, community expertise, and accessible technology, the podcast seeks to reduce systemic barriers, strengthen family advocacy, and advance educational equity for Spanish-speaking Latine families. This intervention demonstrates how educational systems can move beyond compliance with language access requirements toward creating sustainable, equity-focused practices that empower families as informed partners in their children's education.

Discussion

The literature consistently demonstrates that Spanish-speaking Latine families continue to experience significant barriers when navigating the special education process despite legal protections intended to ensure equitable participation. Although IDEA establishes parents as equal members of the Individualized Education Program (IEP) team, research indicates that language barriers, limited access to information, unfamiliarity with educational terminology, and unequal power dynamics continue to influence family participation (Alba et al., 2022; Burke et al., 2020; Mortier et al., 2021). These findings suggest that compliance with legal requirements alone does not guarantee meaningful family engagement.

One of the most significant findings across the literature is that current practices largely focus on providing language access through interpreters and translated documents. While these services remain essential for equitable communication, they often provide information only during formal meetings and do not address families' ongoing need to understand the special education process outside of those interactions. As a result, many families continue to report uncertainty regarding their rights, available services, and advocacy strategies despite receiving interpretation during meetings (Aceves, 2014; Alba et al., 2022).

The proposed podcast addresses this gap by shifting the focus from language access alone to knowledge access. Rather than simply translating information, the podcast provides ongoing, culturally responsive education that families can access throughout their child's educational journey. This distinction is important because equitable participation requires more than the ability to communicate during meetings; it requires families to understand educational systems, procedural safeguards, evaluation processes, and available resources well before critical educational decisions are made. Providing information through an accessible, on-demand platform allows families to build knowledge over time, increasing confidence and strengthening their ability to participate as informed members of the educational team.

The podcast also reflects a strengths-based perspective by recognizing families as knowledgeable partners rather than passive recipients of services. Throughout the literature, Latine families consistently expressed a desire to participate actively in educational decision-making but reported systemic barriers that limited meaningful engagement (Angell & Solomon, 2017; Luna et al., 2023). By centering lived experiences, community voices, and culturally responsive communication, the intervention validates family expertise while promoting collaborative partnerships between schools and families.

This project also has implications for school social workers, special educators, and educational leaders. School social workers are uniquely positioned to advocate for equitable family engagement and reduce systemic barriers through culturally responsive practice. The podcast represents one example of how educational professionals can leverage technology to extend learning opportunities beyond the school setting while strengthening family-school partnerships. As school districts continue working to reduce disproportionality and improve educational equity, interventions that increase family knowledge may complement existing practices and support more inclusive decision-making.

Although this project presents a promising approach to increasing family engagement, additional research is needed to evaluate its effectiveness. Future studies should examine changes in family knowledge, perceptions of empowerment, advocacy behaviors, and participation during IEP meetings. Evaluating these outcomes will contribute to the growing body of research focused on culturally responsive, technology-based interventions designed to reduce systemic barriers in special education.

Conclusion

Meaningful family participation is fundamental to equitable special education practice; however, Spanish-speaking Latine families continue to experience barriers that limit access to information, advocacy, and educational decision-making. The literature demonstrates that language differences, systemic inequities, and unequal power relationships contribute to disparities in family engagement despite federal protections established through the Individuals with Disabilities Education Act (IDEA). Although schools have made important progress by providing interpreters and translated materials, equitable participation requires more than language access alone.

This paper proposes a Spanish-language podcast grounded in the Diversity, Equity, Inclusion, Intersectionality, Power Analysis, and Anti-racism (DEIPAR) framework as an innovative approach to increasing knowledge access for Spanish-speaking Latine families. By providing culturally responsive education about special education, procedural safeguards, family rights, and community resources, the podcast seeks to strengthen advocacy, improve family-school partnerships, and promote more equitable participation throughout the special education process. Rather than replacing existing school-based supports, the podcast complements current practices by providing families with accessible, on-demand educational resources that can be revisited throughout their child's educational journey.

Supporting families with accessible knowledge recognizes parents as essential members of the educational team whose lived experiences, cultural knowledge, and advocacy contribute to student success. Expanding educational resources beyond formal school meetings has the potential to reduce systemic barriers while empowering families to participate as informed and confident partners in educational decision-making. As school districts continue advancing equity-centered practices, interventions that prioritize both language access and knowledge access offer an important opportunity to strengthen collaboration, increase family engagement, and create more inclusive special education systems.

Language access enables communication, but knowledge access enables equitable participation. Ultimately, equitable special education is achieved not only when families can understand the conversation but when they have the knowledge, confidence, and opportunity to shape it.

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

During the preparation of this manuscript, the author used generative artificial intelligence (AI) to assist with editing, organization, and language refinement. The AI-assisted technologies were used solely to improve readability and presentation. The author reviewed, edited, and approved all content and accepts full responsibility for the accuracy, originality, and integrity of the manuscript.

References

Aceves, T. C. (2014). Supporting Latino families in special education through community agency–school partnerships. *Multicultural Education, 21*(3), 45–50.

Alba, L., Anzalone, J., Ramirez, A., & Johnson, A. (2022). Parents' perspectives about special education needs during COVID-19: Differences between Spanish- and English-speaking parents. *Journal of Latinos and Education, 21*(3), 239–250. https://doi.org/10.1080/15348431.2022.2056184

Angell, A. M., & Solomon, O. (2017). "If I was a different ethnicity, would she treat me the same?": Latino parents' experiences obtaining autism services. *Disability & Society, 32*(8), 1142–1164. https://doi.org/10.1080/09687599.2017.1339589

Blanchard, S. B., Newton, J. R., Didericksen, K., Daniels, M. L., & Glosson, K. R. (2021). Confronting racism and bias within early intervention: The responsibility of systems and individuals to influence change and advance equity. *Topics in Early Childhood Special Education, 41*(1), 6–17. https://doi.org/10.1177/0271121421992470

Burke, M. M., Rios, K., Garcia, M., & Magaña, S. (2020). Examining differences in empowerment, special education knowledge, and family-school partnerships among Latino and White families of children with autism spectrum disorder. *International Journal of Developmental Disabilities, 66*(1), 75–81. https://doi.org/10.1080/20473869.2018.1487502

Colorado Department of Education. (2017). *Significant disproportionality in special education*. https://www.cde.state.co.us

Colorado Department of Education. (2022). *Data dashboard*. https://www.cde.state.co.us

Crosnoe, R., & Ansari, A. (2015). Latin American immigrant parents and their children's teachers in U.S. early childhood education programmes. *International Journal of Psychology, 50*(5), 431–439. https://doi.org/10.1002/ijop.12173

Curran, E., & Hulse, D. (2021). Disabling language: The overrepresentation of emergent bilingual students in special education in New York and Arizona. *Fordham Urban Law Journal, 48*(2), 381–448. https://ir.lawnet.fordham.edu/ulj/vol48/iss2/2

Davila, B. (2015). Critical race theory, disability microaggressions, and Latina/o student experiences in special education. *Race Ethnicity and Education, 18*(4), 443–468. https://doi.org/10.1080/13613324.2014.885422

Dyer, K., & Gushwa, M. (2023). DEIPAR social justice framework assessment with case vignettes. In N. L. Currie (Ed.), *Decolonized clinical supervision and leadership: A social work perspective*. Springer.

Korengel, J. E. (2019). Adaptive leadership. *Journal of Research & Practice for Adult Literacy, Secondary & Basic Education, 8*(1), 96–98.

Liu, Y., Simpkins, S. D., & Lin, A. (2018). Ethnic cultural features in organized activities: Relations to Latino adolescents' activity experiences and parental involvement. *Journal of Youth and Adolescence, 47*, 2243–2260. https://doi.org/10.1007/s10964-018-0894-0

Luelmo, P., Kasari, C., & Fundación Educativa. (2021). Randomized pilot study of a special education advocacy program for Latinx/minority parents of children with autism spectrum disorder. *Autism, 25*(6), 1809–1815. https://doi.org/10.1177/1362361321998561

Luna, A., Zulauf-McCurdy, C., Harbin, S., & Fettig, A. (2023). Latina mothers of young children with special needs: Personal narratives capturing the impact of the COVID-19 pandemic. *Topics in Early Childhood Special Education, 42*(4), 302–314. https://doi.org/10.1177/02711214221129240

Mortier, K., Brown, I., & Aramburo, C. (2021). Cultural brokers in special education. *Research and Practice for Persons with Severe Disabilities, 46*(1), 3–17. https://doi.org/10.1177/1540796920975386

National Association of Social Workers. (2021). *Code of ethics of the National Association of Social Workers*. https://www.socialworkers.org/About/Ethics/Code-of-Ethics

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Pedagogical Innovation in Online Learning Environments: Students' Perspectives on Learning Governance

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Abstract

Grounded in the concepts of self-regulated learning and metacognition as key competences in higher education, this study explores adult online students' perceptions of the governance of their own learning. The study was guided by the following research question: *Who governs your learning?* In this study, learning governance refers to students' perceived agency and responsibility in directing, monitoring and regulating their own learning processes. A qualitative thematic analysis was conducted on 166 written reflections produced by adult university students enrolled in a pedagogical training course. The analysis identified five main categories: Learner Agency; Self-Regulation and Learning Management; Procrastination and Self-Regulatory Barriers; Contextual Support and Social Influences; V. Most participants perceived themselves as the primary agents of their learning, emphasising autonomy, responsibility and self-discipline, while also acknowledging the influence of factors such as procrastination, fatigue and competing external demands. The prevalence of metacognitive reflection suggests a high level of awareness of the learning process and of the strategies required to regulate it effectively. The findings indicate that learning governance is primarily perceived as an individual responsibility, although it is shaped by the continuous interaction between personal agency and contextual influences. These results highlight the importance of fostering self-regulation and metacognitive competences through pedagogical practices that promote autonomous learning, particularly in online higher education, where students' active engagement is fundamental to academic success.

Keywords: self-regulated learning, online higher education, metacognition, thematic analysis

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Introduction

Grounded in the concepts of self-regulated learning (Zimmerman, 2002) and metacognition as key competences in higher education (Flavell, 1979), this study explores adult online students' perceptions of the governance of their own learning. Specifically, it seeks to answer the following research question: *Who governs your learning?* In this study, **learning governance** refers to students' perceived agency and responsibility in directing, monitoring and regulating their own learning processes.

Self-regulated learning (SRL) has been extensively investigated in educational psychology and the learning sciences, and is widely recognised as a key determinant of academic success, particularly in online learning environments and among adult learners engaged in lifelong learning (Pintrich, 2004; Zimmerman, 2002). Learning how to learn involves the development of metacognitive, motivational and behavioural competences that enable learners to set goals, monitor their progress and adapt their learning strategies in response to emerging challenges (Schunk & Greene, 2018).

Metacognition, defined as the ability to reflect on one's own thinking and learning processes, is considered fundamental for enabling students to assume responsibility for their educational development (Efklides, 2008; Flavell, 1979). These processes become particularly important in online higher education, where learners are expected to manage their time, learning resources and motivation with a high degree of autonomy (Barnard-Brak et al., 2010).

Research has also highlighted the influence of contextual factors—including teacher support, collaborative learning networks, and family or professional responsibilities—which may either facilitate or constrain students' capacity for self-regulation (Hadwin & Oshige, 2011; Shea & Bidjerano, 2010). Understanding how adult online students perceive the governance of their own learning therefore provides valuable insights for the design of more effective, learner-centred pedagogical practices that foster autonomy, self-regulation and academic success.

Literature Review

Contemporary educational research consistently recognises self-regulated learning (SRL) as a fundamental determinant of academic success, particularly in online learning environments and lifelong learning contexts (Dent & Koenka, 2016; Panadero, 2017). Zimmerman (2002) conceptualises SRL as a cyclical process in which learners set goals, select appropriate strategies, monitor their progress, and adapt their actions in response to feedback and learning outcomes. This perspective positions learners as active agents who assume responsibility for directing and regulating their own learning.

More recent developments have extended this individual perspective by acknowledging the social, emotional and contextual dimensions of learning. Hadwin et al. (2018), for example, argue that regulation may occur not only at the individual level but also through co-regulated and socially shared processes, particularly within collaborative online learning environments. Consequently, learning is no longer viewed solely as an individual cognitive activity but as a relational process shaped by interactions with others and by the surrounding learning context. This perspective is especially relevant in online higher education, where collaboration and peer support play an important role despite geographical separation.

Metacognition remains one of the cornerstones of self-regulated learning. Originally defined by Flavell (1979) as the awareness and regulation of one's own cognitive processes, metacognition enables learners to evaluate their understanding, monitor their progress and adapt their learning strategies. More recent studies (Hofer & Yu, 2022; Zepeda et al., 2019) have shown that learners with higher levels of metacognitive awareness are more likely to regulate their study strategies effectively, manage their time efficiently and overcome distractions—competences that are particularly valuable in online learning environments, where external structure is limited and learner autonomy is considerably greater.

Motivation also plays a central role in the self-regulation process. Self-Determination Theory (Ryan & Deci, 2000) suggests that autonomous and persistent learning is fostered in environments that support learners' needs for autonomy, competence and relatedness. Consistent with this perspective, Cho and Shen (2013) and Cazan (2022) found that students with clearly defined learning goals and a strong sense of personal responsibility demonstrate higher levels of persistence, engagement and academic achievement, even when confronted with significant challenges.

In addition to individual characteristics, external factors such as teacher support, professional and family responsibilities, and the characteristics of digital learning environments significantly influence students' capacity to regulate their learning (Broadbent & Poon, 2015; Kizilcec et al., 2017). For adult learners studying online, balancing academic demands with work and family commitments often represents a major challenge, requiring considerable emotional, motivational and organisational resources.

Taken together, these studies suggest that learning governance extends beyond individual responsibility and emerges from the dynamic interaction between personal agency, metacognitive competence, motivation and contextual conditions. Exploring how adult online students perceive the governance of their own learning may therefore contribute to a better understanding of learner autonomy while informing pedagogical practices that provide appropriate cognitive, motivational and organisational support for successful online learning.

Methodology

Research Design

This study adopted a qualitative descriptive-interpretative approach using qualitative content analysis to explore adult students' perceptions of the governance of their own learning in an online higher education context.

Context and Participants

The study was conducted within an undergraduate course offered by a Portuguese distance-learning university. A purposive, non-probability sample comprising 166 adult students (both male and female) participated in the study. Participants had a mean age of 46 years and were enrolled in fully online study programmes. All were attending a pedagogically oriented course designed to promote reflection on learning processes and the development of learning-to-learn competences.

Data Collection

Data were collected through an individual reflective task based on the following question: *Who governs your learning?* Students were invited to answer this question after reading Letter 6 from *Letters from Gervásio to His Navel*, an educational text specifically designed to stimulate metacognitive reflection. Participants were asked to provide a personal, critical and well-reasoned response, which they submitted via the university's virtual learning environment in a dedicated online discussion forum (*Challenges Forum*).

Data Analysis

The data were analysed using qualitative content analysis. As an initial step, generative artificial intelligence (ChatGPT) was employed to support the preliminary identification of potential thematic categories. These preliminary categories were subsequently reviewed, refined and validated by the researcher through an iterative analytical process. Five overarching categories were identified and operationalised through a set of response indicators designed to capture the nuances of participants' discourse. Representative excerpts were then selected to illustrate the most salient dimensions emerging within each category.

Ethical Considerations

Participation was voluntary and formed part of the normal learning activities of the course, without any impact on students' academic assessment. All responses were anonymised prior to analysis to ensure participants' confidentiality and were used exclusively for research purposes.

Results

A qualitative content analysis of the students' responses to the discussion forum question, *Who governs your learning?*, identified five overarching categories that reflect participants' perceptions of learning governance. Responses ranged from unequivocal assertions of personal responsibility to the recognition of contextual influences and psychological barriers affecting the learning process.

The five categories, together with their corresponding response indicators, descriptions and illustrative quotations, are presented in **Table 1**.

Table 1
Categories Emerging From the Qualitative Content Analysis

Category	Core idea	Typical indicators	Interpretation	Illustrative quotation
1. Learner Agency	Students perceive themselves as the primary agents responsible for directing their own learning.	Personal responsibility; autonomy; self-direction; decision-making; control.	Learning governance is primarily understood as an expression of personal agency, where academic success depends on the learner's own commitment and actions.	"I am the one who governs my learning." "I am responsible for my learning. Everything depends on me."
2. Self-Regulation and Learning Management	Students emphasise planning, organisation and monitoring as essential elements of effective learning.	Planning; time management; goal setting; prioritisation; implementation; self-monitoring; self-evaluation.	Learning is viewed as a structured and intentional process requiring continuous planning, monitoring and adjustment of strategies.	"Students need to plan, carry out and evaluate every learning task." "I organise a study schedule with activities, deadlines and reminder notes."
3. Procrastination and Self-Regulatory Barriers	Internal and external obstacles frequently interfere with students' capacity to regulate their learning.	Procrastination; distractions; fatigue; stress; lack of motivation; competing demands.	Although learners recognise their responsibility, they also acknowledge that maintaining self-regulation requires overcoming persistent psychological and contextual barriers.	"My learning is often influenced by external factors such as work, family and leisure." "Sometimes I feel lost. I know what I should do, but I cannot always put it into practice."
4. Contextual Support and Social Influences	Learning is influenced by interactions with teachers, peers and personal circumstances.	Teachers; classmates; family; employment; personal life; learning resources.	Learning governance is perceived as a socially situated process in which external support and life circumstances shape learners' opportunities for success.	"My teachers support me, but I also need to organise my own study." "I rely on the collaboration of teachers and classmates because online learning is a collaborative process."
5. Metacognitive Awareness and Learning Development	Students demonstrate awareness of their learning processes and recognise that effective learning can be developed over time.	Self-awareness; reflection; self-evaluation; learning to learn; continuous improvement.	Metacognitive reflection enables learners to monitor their progress, recognise strengths and weaknesses, and progressively improve their learning strategies.	"This course taught me that my self-regulatory and metacognitive abilities enabled me to monitor my progress and adjust my focus whenever necessary."

Source: Prepared by the author based on the qualitative content analysis of participants' responses.

Description of the Emergent Categories

1. Learner Agency

Learner agency emerged as the dominant category across participants' responses. Students consistently positioned themselves as the primary agents responsible for directing their own learning, using expressions such as *"I am the one who governs my learning," "It depends on me,"* and *"Only I can govern my learning."* These responses reflect a strong sense of personal responsibility and autonomy, with academic success being perceived as largely dependent on individual commitment, motivation and decision-making.

Rather than attributing learning outcomes to external circumstances, participants emphasised their own capacity to make decisions and assume responsibility for their educational progress. Learning governance was therefore closely associated with personal agency and self-determination.

2. Self-Regulation and Learning Management

The second category highlights students' emphasis on self-regulation as a structured process involving planning, implementation and evaluation. Participants frequently referred to study schedules, calendars, weekly planning, task lists, summaries and the organisation of work across different courses.

These responses indicate that students view successful learning not simply as a matter of motivation but as the result of deliberate planning and continuous monitoring. Self-regulation was therefore described as the practical mechanism through which learners translate intentions into effective learning behaviours.

3. Procrastination and Self-Regulatory Barriers

Procrastination emerged as the principal obstacle to effective learning governance. Participants described a range of internal and external barriers, including distractions, fatigue, stress, competing responsibilities and difficulties maintaining focus.

These accounts reveal an awareness that autonomy alone does not guarantee effective learning. Instead, students recognise that sustaining self-regulation requires continuous effort to overcome behaviours and circumstances that interfere with goal attainment.

4. Contextual Support and Social Influences

Although personal responsibility dominated participants' accounts, many responses acknowledged the contribution of teachers, peers, family members and workplace demands in shaping the learning experience.

Learning governance was therefore not perceived as an entirely individual endeavour but as a socially situated process. Participants recognised that pedagogical support, collaborative relationships and favourable learning conditions facilitate their capacity to regulate learning effectively.

5. Metacognitive Awareness and Learning Development

The final category reflects students' awareness of their own learning processes and their capacity to evaluate and improve them over time. Participants frequently referred to *learning how to learn*, recognising the importance of reflecting on what works, identifying weaknesses and adapting learning strategies accordingly.

Several responses also echoed the central message conveyed throughout the course that effective learners are not born but developed through practice, reflection and continuous self-improvement. This perspective illustrates a strong metacognitive orientation towards learning as a developmental process.

Summary of Findings

Taken together, the five categories reveal a coherent understanding of learning governance among adult online students. Participants overwhelmingly perceived learning as an individual responsibility, exercised through self-regulation, strategic planning and metacognitive reflection. At the same time, they recognised that successful learning is influenced by contextual factors, including social support, professional commitments and family responsibilities.

Overall, the findings portray learning as an active, intentional and continuously regulated process rather than a passive acquisition of knowledge. Learning governance therefore emerges as a dynamic interaction between personal agency, self-regulatory competence and contextual influences. While participants acknowledged the challenges posed by procrastination and competing life demands, they also demonstrated a strong commitment to developing strategies that enable them to maintain control over their learning and achieve their academic goals.

Taken together, the findings support a conceptual understanding of learning governance as a dynamic and multidimensional process. Learner agency emerges as its core dimension, enacted through self-regulation and metacognitive awareness, while simultaneously shaped by self-regulatory barriers and contextual influences.

Discussion

The findings of this study indicate that adult online students perceive themselves as the principal agents responsible for directing and governing their own learning. This perception is consistent with the extensive body of research on self-regulated learning, which conceptualises learners as active participants who plan, monitor, regulate and evaluate their own learning processes (Zimmerman, 2000; Zimmerman & Moylan, 2009). Rather than describing learning as the passive acquisition of knowledge, participants portrayed it as an intentional, goal-directed and continuously regulated process.

The prominence of learner agency across participants' accounts represents one of the most significant findings of the study. Expressions such as *"I am the one who governs my learning"* or *"Everything depends on me"* reveal a strong sense of personal responsibility and ownership of the learning process. These findings reinforce previous research demonstrating that successful online learners assume an active role in managing their

learning and recognise autonomy as a prerequisite for academic success (Rosales-Marquez et al., 2023).

Participants' accounts also highlighted the practical implementation of self-regulated learning strategies. Frequent references to planning, time management, goal setting, prioritisation and self-monitoring closely correspond to the cyclical phases described in classical models of self-regulated learning (Pintrich, 2000, 2004; Zimmerman, 2000). Rather than merely expressing positive attitudes towards autonomous learning, participants described concrete strategies that translate intentions into effective learning behaviours. This finding suggests that self-regulation is not perceived as an abstract competence but as a practical set of behaviours through which learners exercise agency.

Motivation also emerged as an important component of learning governance. References to determination, persistence, discipline and confidence indicate that participants perceived successful learning as dependent not only on effective strategies but also on sustained motivational engagement. This finding aligns with Self-Determination Theory (Ryan & Deci, 2000), which emphasises that autonomous learning is fostered when individuals experience autonomy, competence and relatedness.

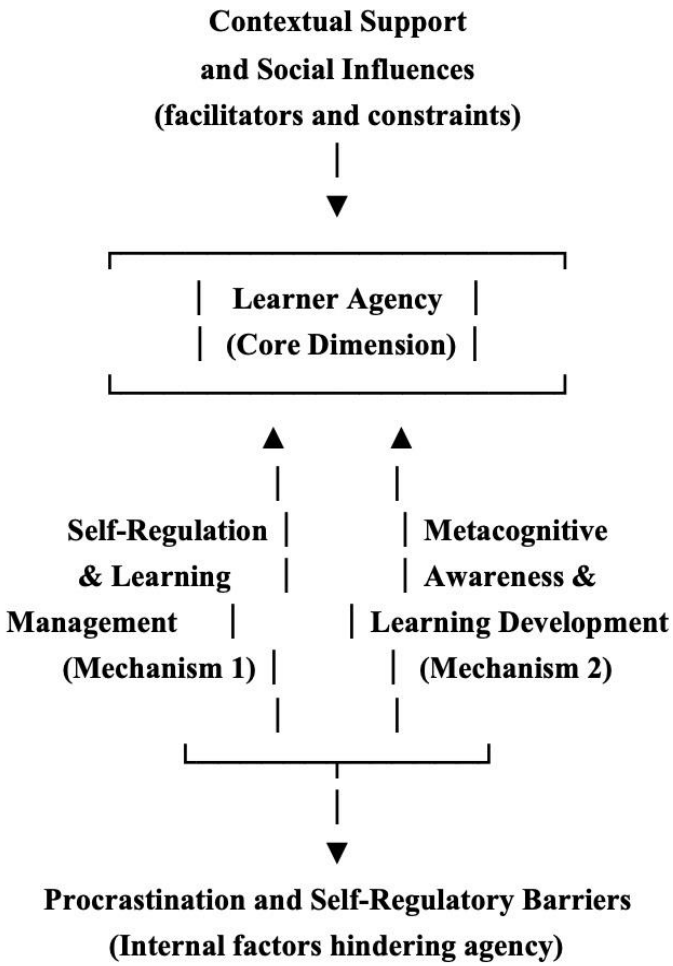
At the same time, participants acknowledged that exercising learner agency is neither automatic nor free from challenges. Procrastination, fatigue, competing responsibilities and digital distractions were frequently identified as barriers that interfere with self-regulation. These findings are consistent with previous studies describing procrastination as a failure of volitional regulation, whereby learners struggle to maintain effort and persistence despite their intentions (Panadero & Tapia, 2014). The recognition of these barriers demonstrates that participants understand learning governance as a continuous process of self-monitoring and behavioural regulation rather than a stable personal characteristic.

Metacognitive awareness constitutes another central dimension of the findings. Participants demonstrated the ability to reflect critically on their learning strategies, evaluate their effectiveness and make adjustments when necessary. Such responses illustrate the metacognitive processes described by Flavell (1979) and further developed by Panadero and Tapia (2014), confirming that effective learners continuously monitor and refine their approaches to learning. Rather than viewing academic success as the result of innate ability, participants emphasised learning as a competence that can be progressively developed through reflection and deliberate practice.

Taken together, these findings support a conceptual understanding of learning governance as a dynamic and multidimensional process. Based on the empirical evidence, we propose a *Conceptual Model of Learning Governance in Online Higher Education* **(**Figure 1), in which learner agency represents the central dimension. This agency is enacted through two complementary mechanisms—self-regulation and learning management and metacognitive awareness—while simultaneously influenced by self-regulatory barriers, such as procrastination, and by contextual support and social influences**,** including teachers, peers and learners' personal circumstances. The proposed model suggests that learning governance is neither exclusively individual nor entirely context-dependent; rather, it emerges from the dynamic interaction between personal agency, regulatory competences and environmental conditions.

From a pedagogical perspective, these findings have important implications for online higher education. Promoting learner autonomy requires more than providing flexible learning opportunities. Educational practices should intentionally foster self-regulatory and metacognitive competences while creating supportive learning environments that help students manage the motivational and contextual challenges associated with adult online learning. Consequently, learning governance should be understood not merely as an individual responsibility but as a developmental process that can be strengthened through appropriate pedagogical design and institutional support.

Figure 1
Conceptual Model of Learning Governance in Online Higher Education



Source: Author's conceptualisation derived from the empirical findings.

Conclusion

This study explored adult online students' perceptions of the governance of their own learning through a qualitative analysis of their reflective accounts. The findings indicate that students predominantly perceive themselves as the principal agents responsible for directing and regulating their learning. At the same time, they recognise that effective learning governance depends on the interaction between personal agency, self-regulatory competences, metacognitive awareness and the contextual conditions in which learning takes place.

Building on these findings, this study proposes a *Conceptual Model of Learning Governance in Online Higher Education*, in which learner agency constitutes the central dimension of the learning process. This agency is enacted through self-regulation and learning management and metacognitive awareness, while simultaneously influenced by self-regulatory barriers, such as procrastination, and by contextual support and social influences. The model contributes to extending current understandings of self-regulated learning by integrating these dimensions into a coherent framework that reflects students' own perceptions of learning governance.

The findings also reinforce the view that effective learning is not an innate characteristic but a competence that can be progressively developed through deliberate practice, reflection and strategic regulation. Participants' emphasis on planning, time management, self-monitoring and continuous improvement aligns with contemporary perspectives that conceptualise self-regulation as a learnable and transferable competence rather than merely a study technique.

From a pedagogical perspective, the study highlights the importance of designing online learning environments that intentionally foster learner agency, self-regulatory competences and metacognitive reflection. Supporting students in developing these capabilities may enhance not only academic performance but also their capacity for lifelong learning and autonomous professional development.

This study is not without limitations. The findings are based on reflections collected from students attending a single pedagogically oriented course within one Portuguese distance-learning university. Consequently, the results should be interpreted within this specific educational context. Future research could examine the proposed conceptual model across different higher education institutions, disciplinary areas and cultural settings, while also exploring its relationships with academic performance, persistence and student engagement through mixed-methods or longitudinal research designs.

Overall, the study suggests that learning governance should be understood as a dynamic, multidimensional and developmental process, emerging from the continuous interaction between learner agency, self-regulatory competences and contextual influences. This perspective offers a meaningful contribution to contemporary discussions on self-regulated learning in online higher education and provides a framework for future research and pedagogical innovation.

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

The author declares that ChatGPT, an AI-assisted writing software, was used as a tool to support the initial coding, with the researcher responsible for reviewing, interpreting and validating the categories.

It was also used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity.

References

Barnard-Brak, L., Paton, V. O., & Lan, W. Y. (2010). Profiles in self-regulated learning in the online learning environment. *The International Review of Research in Open and Distributed Learning*, *11*(1), 61–80. https://doi.org/10.19173/irrodl.v11i1.769

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education*, *27*, 1–13. https://doi.org/10.1016/j.iheduc.2015.04.007

Cazan, A.-M. (2022). Self-regulated learning and academic performance in online higher education: The role of metacognitive skills and academic resilience. *Frontiers in Psychology*, *13*, 848920. https://doi.org/10.3389/fpsyg.2022.848920

Cho, M.-H., & Shen, D. (2013). Self-regulation in online learning: A strategy to improve learning achievement and satisfaction. *International Journal on E-Learning*, *12*(4), 455–470.

Dent, A. L., & Koenka, A. C. (2016). The relation between self-regulated learning and academic achievement across childhood and adolescence: A meta-analysis. *Educational Psychology Review*, *28*(3), 425–474. https://doi.org/10.1007/s10648-015-9320-8

Efklides, A. (2008). Metacognition: Defining Its Facets and Levels of Functioning in Relation to Self-Regulation and co-Regulation. *European Psychologist*, *13*, 277–287. https://doi.org/10.1027/1016-9040.13.4.277

Flavell, J. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. *American Psychologist*, *34*, 906–911. http://dx.doi.org/10.1037/0003-066X.34.10.906

Hadwin, A., & Oshige, M. (2011). Self-Regulation, Coregulation, and Socially Shared Regulation: Exploring Perspectives of Social in Self-Regulated Learning Theory. *Teachers College Record*, *113*, 240–264. https://doi.org/10.1177/016146811111300204

Hadwin, A. F., Järvelä, S., & Miller, M. (2018). Self-regulated, co-regulated, and socially shared regulation of learning. In D. H. Schunk & J. A. Greene (Eds.), *Handbook of self-regulation of learning and performance* (2nd ed., pp. 83–106). Routledge.

Hofer, B. K., & Yu, S. (2022). Metacognition and learning in the digital age: An updated agenda. *Educational Psychologist*, *57*(2), 103–115. https://doi.org/10.1080/00461520.2022.2032797

Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in massive open online courses. *Computers & Education*, *104*, 18–33. https://doi.org/10.1016/j.compedu.2016.10.001

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, *8*, 422. https://doi.org/10.3389/fpsyg.2017.00422

Panadero, E., & Tapia, J. (2014). How do students self-regulate? Review of Zimmerman‟s cyclical model of self-regulated learning. *Anales de psicologia, 30*(2), 450–462.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451–502). Academic Press.

Pintrich, P. R. (2004). A Conceptual Framework for Assessing Motivation and Self-Regulated Learning in College Students. *Educational Psychology Review*, *16*, 385–407. http://dx.doi.org/10.1007/s10648-004-0006-x

Rosales-Marquez, C., Silva-Aguilar, A., Miranda-Vargas, V., & Salas-Sanchez, R. (2023). Self-regulated learning for learning to learn in higher education. *Human Review. International Humanities Review / Revista Internacional de Humanidades, 21*(2), 269–281.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press.

Schunk, D. H., & Greene, J. A. (Eds.). (2018). *Handbook of self-regulation of learning and performance* (2nd ed.). Routledge/Taylor & Francis Group.

Shea, Peter. (2010). Learning presence: Towards a theory of self-efficacy, self-regulation, and the development of a communities of inquiry in online and blended learning environments. *Computers & Education*, *55*, 1721–1731. http://dx.doi.org/10.1016/j.compedu.2010.07.017

Zepeda, C. D., Richey, J. E., Ronevich, P., & Nokes-Malach, T. J. (2019). Direct instruction of metacognition benefits adolescent science learning, transfer, and motivation: An investigation of real-world classrooms. *Metacognition and Learning*, *14*(4), 545–569. https://doi.org/10.1007/s11409-019-09179-0

Zimmerman, B. J. (2000). Attaining Self-Regulation: A Social Cognitive Perspective. In M. Boekerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp.13–39). Academic Press.

Zimmerman, B. J. (2002). Becoming a Self-Regulated Learner: An Overview. *Theory Into Practice, 41*, 64–70. http://dx.doi.org/10.1207/s15430421tip4102_2

Zimmerman, B. J., & Moylan, A. R. (2009). Self-Regulation: Where Metacognition and Motivation Intersect. In: D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *The Educational Psychology Series*. *Handbook of Metacognition in Education* (pp. 299–315). Routledge.

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Bridging Capital and Countryside: *AMAE Educando Magazine* and Teacher Training in Minas Gerais, Brazil

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Abstract

This research focuses on the *AMAE Educando Magazine*, a pedagogical publication central to teacher training in the state of Minas Gerais, southeastern Brazil. The magazine was created within the Institute of Education of Minas Gerais (IEMG), a flagship public teacher-training school located in Belo Horizonte, the state capital. Founded in 1946, the IEMG was initially an exclusive school for young women from the elite, renowned for its high-quality teacher preparation. From this influential institution emerged the *AMAE Educando Magazine* in 1967. Its primary mission was to disseminate the content of the Pedagogical Journeys organized by the IEMG's School Administration Course, thereby creating a vital bridge between teachers in the capital and those in the vast and often isolated interior regions of Minas Gerais. The magazine circulated for an impressive 46 years, producing 400 issues. This study aims to understand how the *AMAE Educando Magazine* fulfilled its formative function for teachers across Minas Gerais and how it consolidated itself as a key communication channel between the capital and the countryside. To achieve this, the research employs qualitative document analysis of the magazine's foundational years (1967–1972). It examines articles on teacher training, reports from the Pedagogical Journeys, and readers' letters. Preliminary findings indicate that it served as a powerful tool for disseminating pedagogical knowledge, creating a professional network, and standardizing training practices statewide. In conclusion, this magazine was not merely a publication but a cultural and educational artifact fundamental to understanding the history of teacher training and regional integration in Brazil.

Keywords: AMAE Educando Magazine, Minas Gerais' Institute of Education, teacher training

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Introduction

This research investigates the pedagogical periodical *AMAE Educando Magazine*, a printed pedagogical publication from the state of Minas Gerais, which originated at the Institute of Education of Minas Gerais (IEMG) in the late 1960s. At that time, marked by the absence of digital resources as we know them today — resources that now grant us nearly instantaneous access to information — knowledge depended on material supports such as newspapers, magazines, books, and similar printed matter. Their distribution, however, was confined to certain localities, and waiting times were lengthy. For this reason, physical periodicals occupied a central role in intellectual formation and in the dissemination of professional knowledge. Hence, the decision to study this magazine is primarily aimed at understanding, within the delimited timeframe (1967–1972), its conditions of production, materiality, target readership, and the possible effects it may have produced among its female readers.

Concerning the material under analysis, *AMAE Educando Magazine* was a pedagogical publication conceived by students of the School Administration Course (*Curso de Administração Escolar – CAE*) at the Institute of Education of Minas Gerais (IEMG), with its first issue released in October 1967. A few months earlier, in April 1967, the AMAE (*Associação Mineira de Administração Escolar – Minas Gerais School Administration Association)* had been established, with the primary objective of bringing together primary school teachers from the capital and the interior of the state to facilitate the exchange of knowledge and experiences among them. The magazine circulated for 46 years, from 1967 to 2013, totalling 400 published issues over that period.

The School Administration Course (CAE) at the IEMG was a benchmark in teacher education within the state and across Brazil. It emerged in 1946 following the dissolution of the *Escola de Aperfeiçoamento* (Advanced Teacher Training School, 1929–1946) and was composed of tenured teachers actively working in the state education system, selected through rigorous evaluations. Its main purpose was to train educational professionals, such as principals, school inspectors, and guidance counselors, to serve within the state and regional education systems, as well as within the State Department of Education itself.

The impetus for conducting this study stems from the relevance that this pedagogical periodical held for education over nearly half a century of uninterrupted publication, mobilising its pedagogical forces and establishing connections with different regions of Minas Gerais and, later, throughout Brazil. The choice to examine the magazine's first five years of circulation (1967–1972) is justified by the fact that this period encompasses the year of its inception in Minas Gerais's educational landscape, its early years of distribution, the context of the Civil-military Dictatorship in Brazil, the creation of the IEMG's Pedagogy Course (1968), the Teaching Reform instituted by Law No. 5.692/71, and the magazine's role in presenting the curricular and organisational changes introduced for primary and secondary education (1º e 2º graus) as a result of that legislation.

Scholarly work on *AMAE Educando Magazine* remains scarce. A bibliographic review using the descriptor “Revista AMAE Educando” revealed that the magazine's presence in Brazilian academic production is limited. Therefore, given the paucity of studies and publications on this subject, we understand that this paper offers new contributions to its understanding, as it draws upon sources that have thus far received little scholarly attention.

History of the *AMAE Educando Magazine* and the Pedagogical Journeys

AMAE Educando Magazine was first published in October 1967, a few months after the establishment of the *Associação Mineira de Administração Escolar* (AMAE – Minas Gerais School Administration Association) in April of that same year. According to Scyomara Ribeiro de Almeida, the magazine's first editor-in-chief, in an interview granted to Celuta Penna and Rosa Emília Mendes published in the commemorative twentieth-anniversary edition of October 1986, the idea of creating an association emerged in 1966. At that time, a group of CAE students travelled to Rio de Janeiro to attend the *I Congresso Brasileiro de Ensino Normal* (COBEN – First Brazilian Congress of Teacher Education), held from 11 to 16 July. During the congress, upon encountering so many new developments, they felt the need to convene teachers and establish a group that could strengthen the network of educators between the state capital and the interior of Minas Gerais, as they perceived a significant lack of communication and exchange among municipalities.

Upon their return to Belo Horizonte, the matter reverberated throughout the Institute of Education, and CAE faculty members became interested in the proposal. Consequently, they organised a group of teachers and students and scheduled an initial meeting at the IEMG, designated as the First State Meeting on Educational Guidance and Teaching, which took place from 17 to 22 October 1966. Participants were convened through an announcement published in the Jornal Minas Gerais. A few months after this gathering, the *Associação Mineira de Administração Escolar* (AMAE) was officially founded in April 1967.

As an association, AMAE played a prominent role not only in the creation of the magazine but also in promoting events aimed at discussing relevant issues of the time, including courses, Pedagogical Journeys, congresses, and meetings. The association was also responsible for producing other pedagogical materials, such as collections of content on subjects like Mathematics, Communication and Expression, Physical and Biological Sciences, and Social Studies. The courses and meetings offered addressed pertinent topics, including planning and evaluation, literacy, children's literature, reading and writing, grade repetition, and school dropout rates. There was, therefore, substantial demand for the courses and meetings promoted by the Association, as reported in the magazine's pages. The organisation of the Pedagogical Journeys even counted on the participation and encouragement of politicians from the state of Minas Gerais.

History of the Institute of Education of Minas Gerais (IEMG)

In the early twentieth century, Institutes of Education began to emerge in Brazil. According Louro (2004), teacher training took place in normal schools operating within these institutions, which were known for being extremely well-organised and for upholding a commitment to educational excellence. According to Veiga (2007), at the beginning of the 1930s, the *Instituto de Educação do Distrito Federal* was established in the city of Rio de Janeiro as a new and significant model of normal school organisation, which later spread to other cities across Brazil. Its primary goal was to become a benchmark in teacher education, offering a wide range of courses, in addition to imposing facilities and a diverse array of teaching materials.

Belo Horizonte followed a similar trajectory. According to Campos (2019), the Institute of Education of Minas Gerais (IEMG) began its activities in 1946, under the Organic Law of Teacher Education (*Lei Orgânica do Ensino Normal*) – Decree-Law No. 8.520, of 2 January – whereby the *Escola Normal Modelo* (Model Normal School), created in 1906, was

redesignated as the *Instituto de Educação do Estado de Minas Gerais* (IEMG). With this transition, the School Administration Course (*Curso de Administração Escolar – CAE*) was also established at the IEMG in that same year, 1946.

It is important to note that, according to Moreno and Vago (2015), the *Escola Normal Modelo* was created in 1906 as part of the reform promoted by the government of João Pinheiro, which reinstated teacher education in Minas Gerais (Law No. 439 of 28 September 1906). This came after normal schools had been suspended in the state since 1901 (Law No. 318 of 16 September 1901) due to the financial crisis that the state was undergoing at the time.

Since its creation, the IEMG established itself as a traditional school of great prominence and prestige at both the state and national levels, responsible for the education of many generations of Minas Gerais residents. The CAE (School Administration Course), one of the programmes offered at the IEMG, was not aimed at training for the daily practice of classroom teaching. Its explicit purpose was to qualify teachers who had already graduated to become school administrators — that is, to assume pedagogical and administrative leadership within a school environment that was already highly feminised. The course thus constituted a space of differentiation and professional elite status, creating an internal hierarchy within the female teaching profession. This selectiveness was reinforced by the social profile of its students, who were selected through rigorous evaluations and required to have previously completed the normal course, a prerequisite that suggests the programme predominantly attracted daughters of the Minas Gerais elite, whether economic, cultural, or intellectual.

Methodology

This study will adopt as its main methodological procedure the systematic analysis of printed materials, grounded in documentary research on the issues of the *AMAE Educando Magazine* published during its first five years of circulation (1967–1972). It is important to note that this is ongoing research — that is, the final results of the proposed analyses have not yet been reached.

The investigation will be developed through complementary analytical axes, employing a historical and documentary approach to examine the contents published by the magazine, its structure, and the interactions established with its readership. The aim is to understand how the content of the analysed materials provides evidence that the intentionality of the text was to shape the primary school teacher. Furthermore, it seeks to reflect upon which contents were used to educate a teacher and which pedagogical practices were most widely disseminated. A total of 52 issues of the magazine, published between 1967 and 1972, will be analysed. It is important to highlight that, on average, 9 to 10 issues were published per year (from January to December, with some months omitted), and each issue contained between 40 and 60 pages.

Concerning the published content, the materials selected for analysis will include reports on the Pedagogical Journeys (organised by year and theme); the readers' letters section; and articles on literacy aimed at teacher training. These materials will constitute the analytical categories. Among the prescriptive articles for classroom practice, the focus was placed on the theme of literacy, since it would not have been possible to analyse the entirety of the contents published by the magazine due to time constraints and the sheer volume of material. The magazine encompasses articles on various subjects within the educational field, including school management, didactics, and lesson plans (mathematics, social studies, arts, sciences, religious education, etc.), educational psychology, the implementation of laws, civic dates,

grammatical rules, and so forth. However, given time limitations and the documentary volume, it was necessary to establish delimitations. Accordingly, the analysis will concentrate on literacy content found in the language sections, given its relevance to primary school teacher training—a choice that does not diminish the importance of the other themes addressed.

Firstly, in order to achieve the defined objectives, Bardin's (2011) content analysis method will be employed, aiming for thematic categorisation of the selected materials. The process will follow three main stages: pre-analysis, involving the final selection of the magazine's articles and letter sections to be studied; the next step, exploration of the selected material, during which a thorough reading of the texts will be conducted, highlighting relevant passages concerning teacher training and assigning codes to them according to emerging themes and the classification of letters by categories; and finally, the processing and interpretation of results, which consists of grouping related codes into consolidated thematic categories. From there, it will be possible to analyse the frequency and relationship between such categories, enabling inferences and interpretations grounded in teacher education theories, the history of education, and political movements. The ultimate purpose is to understand the role that the magazine effectively played in teacher education in Minas Gerais.

Concurrently, the approach proposed by Galvão and Melo (2019) will be followed for a detailed examination of the material and editorial aspects that shaped the magazine's production, including not only its physical dimensions, format, number of pages, and print quality, but also graphic elements such as typography, visual hierarchy, and the spatial organisation of content. The analysis will further encompass elements such as the cover, back cover, and advertisements, as well as possible indicators of circulation and usage. Based on this examination, tables will be constructed to categorise and organise all the information gathered.

The Pedagogical Journeys will be classified by theme and by year in order to ascertain which subjects were most relevant to educational discussions during the period under study, thereby allowing us to relate these identified subjects to the contemporary context. The articles on literacy will be classified into categories (methods, concept, readiness, and learning difficulties) and some subcategories (methods: global, phonic, other; and learning difficulties: school failure/dropout and grade repetition, and language disorders) in order to understand the concept of literacy, what was believed to be the best method, the best classroom practice, and how to deal with difficulties concerning children's learning. This classification enables an understanding of how the articles intended to guide teachers in their daily practice. The readers' letters will be classified into three categories: praise, criticism, and requests. From these surveys, inferences will be made regarding the degree of audience satisfaction, allowing the editorial team to identify strengths to be expanded, weaknesses to be addressed, as well as to raise other demands that emerged through the requests. This systematisation transforms the letters not only into a space of expression but also into an instrument offering suggestions for the magazine's improvement.

Conclusion

This ongoing study examines the first five years of circulation (1967–1972) of the *AMAE Educando Magazine*, focusing on its conditions of production, materiality, target readership, and the pedagogical discourse it disseminated, particularly regarding literacy and teacher training. Although the results are still partial and the analyses have not yet been fully concluded, the preliminary findings indicate that the magazine functioned as a significant

vehicle for professional development, articulating educational debates and reinforcing a hierarchical, elite-oriented model of teaching through the School Administration Course (CAE). Its pages not only reflected but also actively shaped the pedagogical practices and expectations surrounding primary school teachers in Minas Gerais during a period of profound educational reform. The implications of this research point to the need for renewed attention to printed pedagogical materials as historical sources that reveal the interplay between policy, practice, and gender dynamics in education.

However, this study is limited to the magazine's first five years, leaving a substantial body of subsequent issues unexplored. Moreover, even within this initial period, numerous themes, such as school management, didactics, and other curricular subjects, remain to be systematically analysed. Future research is therefore recommended to extend the chronological scope and to investigate the multiple dimensions of content that time constraints will not permit us to address, thereby offering a more comprehensive understanding of this magazine's enduring influence on Brazilian teacher education.

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

The author declares that Grammarly, an AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from Grammarly, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Bardin, L. (2011). *Análise de conteúdo* [Content analysis]. Edições 70.

Biccas, M. de S. (2008). *O impresso como estratégia de formação: Revista de Ensino de Minas Gerais (1925–1940)* [The printed material as a training strategy: Revista de Ensino de Minas Gerais (1925–1940)]. Argumentum.

Campos, R. (2019). *Escolas de Belo Horizonte: memória e história* [Belo Horizonte schools: memory and history]. Blogger.

Coelho, M. I. M., et al. (1990). Escola Normal - *IEMG: Reconstrução da História da Educação Elementar (MG, 1906–69)* [Normal School - IEMG: Reconstruction of the History of Elementary Education (MG, 1906–69)] [Research Report]. INEP-MEC.

Galvão, A. M. de O., & Melo, J. F. (2019). Análise de impressos e seus leitores: uma proposta teórica e metodológica para pesquisas em história da educação. [Analysis of printed materials and their readers: a theoretical and methodological proposal for research in the history of education]. In C. G. Veiga & M. A. T. de Oliveira (Eds.), *Historiografia da educação: abordagens teóricas e metodológicas* [Historiography of education: theoretical and methodological approaches] (1st ed., pp. 223–259). Fino Traço.

Kulesza, W. A. (2019). *A Escola de Aperfeiçoamento em Belo Horizonte* [The Advanced Teacher Training School in Belo Horizonte] (1st ed.). Appris.

Louro, G. L. (2004). Mulheres na sala de aula. [Women in the classroom]. In M. D. Priori (Ed.), *História das mulheres no Brasil* [History of women in Brazil] (7th ed., pp. 443–479). Contexto.

Moreno, A., & Vago, T. M. (2015). *Do ensino normal depende a efficiencia do ensino primário: fontes para histórias da Educação Física em Minas Gerais (1890–1940)* [On the normal education depends the efficiency of primary education: sources for histories of Physical Education in Minas Gerais (1890–1940)]. Mazza Edições.

Veiga, C. G. (2007). *História da Educação* [History of Education] (1st ed.). Ática.

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Design, Implementation and Sustainability of Mobile Learning in Primary Education: A Longitudinal Case Study

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Abstract

The sustained integration of innovative digital technologies in school education remains a complex challenge, particularly in primary education, where pedagogical, organizational, and human factors strongly influence innovation processes. This study examines the design, implementation, and long-term sustainability of mobile learning as an educational innovation in a Greek experimental primary school. The research was conducted as a three-year longitudinal qualitative case study, adopting a human-centered and systemic perspective on educational change. Data were collected through vignettes, questionnaires, semi-structured interviews, focus groups, participant observation, reflective field notes, research diaries, instructional artefacts, and school documentation. The qualitative material was analyzed through reflexive thematic analysis supported by ATLAS.ti software and theoretically informed by the human-centered sustainability framework of Ng and Nicholas. The findings indicate that sustainable mobile learning integration did not emerge solely from technological availability, but through a gradual process of teacher professional learning, distributed leadership, collaborative school culture, and recognition of the pedagogical value of mobile technologies. While pedagogical, social, and organizational dimensions were strongly developed, economic and technological constraints remained ongoing challenges. The study contributes empirical evidence on how innovative technologies can become embedded in primary education and highlights the importance of human-centered design, contextual adaptation, and long-term support for achieving sustainable educational change.

Keywords: mobile learning, educational innovation, primary education, sustainability, teacher professional learning

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Introduction

The rapid evolution of digital technologies continues to reshape educational systems worldwide, creating increasing expectations for schools to adopt innovative pedagogical approaches that enhance teaching and learning. Among these innovations, mobile learning has attracted considerable attention because of its capacity to promote flexible, learner-centered, collaborative, and context-aware educational experiences (Crompton & Burke, 2023; Dorris et al., 2024). Mobile devices provide opportunities for personalized learning, immediate access to digital resources, authentic inquiry, and the development of students' digital competence, which has become a fundamental educational priority in the twenty-first century (OECD, 2024; UNESCO, 2023).

Despite these promising affordances, research consistently demonstrates that the educational value of mobile technologies depends less on the devices themselves than on the pedagogical and organizational conditions under which they are implemented (Dorris et al., 2024; Fullan, 2016). Numerous school initiatives achieve high levels of initial enthusiasm but gradually diminish once external funding, technical support, or project leadership is withdrawn. Consequently, the long-term sustainability of educational innovation has emerged as one of the most significant challenges in contemporary educational research (Prenger et al., 2022).

Within primary education, these challenges become even more evident. Teachers frequently encounter barriers related to professional confidence, pedagogical integration, infrastructure, curriculum alignment, and institutional support (Blackmore & Rønningsbakk, 2023; Crompton & Burke, 2023). Accordingly, successful mobile learning implementation requires more than technological infrastructure; it demands continuous professional learning, collaborative school cultures, supportive leadership, and organizational conditions that enable innovation to become embedded in everyday educational practice (Hargreaves & O'Connor, 2018; Harris et al., 2022).

Recent international literature increasingly adopts a human-centered perspective, recognizing that sustainable educational innovation is fundamentally shaped by teachers, school leaders, and learning communities rather than by technology itself (Ng & Nicholas, 2012; OECD, 2024). From this perspective, sustainability is viewed as a dynamic process through which educational innovations gradually become integrated into the culture, routines, and pedagogical practices of a school.

Responding to this research need, the present study investigates the design, implementation, and long-term sustainability of mobile learning within a Greek experimental primary school through a three-year longitudinal qualitative case study. Drawing on a human-centered sustainability framework, the research explores how leadership practices, school-based professional development, collaborative learning, and teachers' evolving pedagogical beliefs contributed to the sustained integration of mobile technologies into everyday teaching. By examining innovation as a gradual organizational and pedagogical process rather than a technological intervention, the study contributes empirical evidence to the growing international literature on sustainable educational innovation in primary education.

Literature Review

Mobile Learning in Primary Education

Mobile learning has evolved from a technology-driven concept into a pedagogical approach that promotes flexible, personalized, and context-aware learning experiences extending beyond traditional classroom settings. The widespread availability of tablets and other mobile devices has enabled primary schools to redesign teaching practices by supporting inquiry-based learning, collaboration, creativity, and differentiated instruction. Rather than functioning merely as digital substitutes for conventional resources, mobile technologies increasingly facilitate active student participation and authentic learning experiences (Blackmore & Rønningsbakk, 2023; Crompton & Burke, 2023).

Recent systematic reviews demonstrate that mobile learning can positively influence students' engagement, motivation, digital competence, and academic achievement when implementation is grounded in sound pedagogical principles rather than technological novelty (Crompton & Burke, 2023; Dorris et al., 2024). At the same time, researchers emphasize that successful mobile learning depends on teachers' pedagogical competence, instructional design, and the degree to which technology is meaningfully aligned with curriculum objectives (OECD, 2024; UNESCO, 2023).

Nevertheless, several studies indicate that many mobile learning initiatives remain confined to pilot projects or externally supported interventions and fail to become embedded in everyday educational practice (Prenger et al., 2022). Consequently, current research has shifted its focus from technology adoption toward understanding the conditions that support long-term sustainability within school organizations.

Educational Innovation and School-Based Change

School leadership represents one of the most influential factors affecting the implementation and sustainability of educational innovation. Rather than focusing exclusively on administrative management, contemporary leadership models emphasize collaboration, distributed decision-making, and the development of professional learning communities (Harris et al., 2022).

Distributed leadership enables teachers to assume active roles in instructional improvement, thereby strengthening ownership of innovation and promoting collective responsibility for school development. School leaders who encourage experimentation, provide pedagogical support, and cultivate collaborative cultures create organizational conditions that facilitate long-term educational change (Hargreaves & O'Connor, 2018; Harris et al., 2022).

Equally important is continuous professional development. Evidence from educational change research indicates that isolated workshops rarely produce sustained changes in classroom practice. Instead, professional learning is most effective when it is school-based, collaborative, practice-oriented, and directly connected to teachers' everyday instructional experiences (Darling-Hammond et al., 2017; OECD, 2024). Ongoing reflection, peer collaboration, coaching, and classroom experimentation contribute significantly to teachers' confidence in integrating digital technologies into pedagogical practice.

Sustainability of Mobile Learning

The concept of sustainability has become central to research on educational technology as attention shifts from initial implementation toward the long-term continuation of innovation (Prenger et al., 2022). Sustainable technology integration refers not merely to the continued use of digital devices but to the extent to which innovative pedagogical practices become embedded within everyday teaching, organizational routines, and school culture.

Among the theoretical models proposed in the literature, the framework developed by Ng and Nicholas (2012) remains particularly influential for understanding mobile learning sustainability. Their human-centered model conceptualizes sustainability as the interaction of pedagogical, social, technological, organizational, and economic dimensions, emphasizing that innovation is maintained primarily through human agency rather than technological infrastructure alone.

Recent international reports similarly argue that successful digital transformation depends on systemic educational change involving leadership, teacher capacity building, collaborative cultures, equity considerations, and continuous institutional support rather than on investments in technology alone (OECD, 2024, 2025; UNESCO, 2023). Sustainable innovation therefore emerges as a dynamic organizational process through which educational communities progressively integrate new pedagogical practices into their daily work.

Research Gap

Although recent studies have substantially advanced understanding of mobile learning in schools, several limitations remain. Most published research examines relatively short-term interventions, focuses primarily on student outcomes, or evaluates isolated technological initiatives. Longitudinal qualitative investigations exploring how mobile learning evolves within the everyday life of a school over multiple years remain comparatively limited, particularly in primary education.

Furthermore, few studies simultaneously examine leadership practices, teacher professional learning, organizational culture, and sustainability through a human-centered perspective. Addressing this gap, the present study investigates the design, implementation, and long-term sustainability of mobile learning through a three-year longitudinal qualitative case study conducted in a Greek experimental primary school. By examining innovation as an evolving organizational and pedagogical process, the study contributes empirical evidence regarding the conditions that support sustainable educational change in primary education.

Methodology

Research Design

This study adopted a qualitative longitudinal case study design to investigate the design, implementation, and sustainability of mobile learning as an educational innovation within a real-world primary school context. A qualitative approach was considered appropriate because the study sought to explore participants' experiences, meanings, interactions, and evolving perceptions rather than measure predefined variables (Merriam & Tisdell, 2016).

The research followed the same school community over three consecutive school years, from 2021 to 2024, enabling an in-depth examination of how mobile learning evolved from its initial implementation to its later institutionalization. This longitudinal perspective allowed sustainability to be understood as a dynamic and evolving process rather than a static outcome.

The study was theoretically informed by the human-centered sustainability framework proposed by Ng and Nicholas (2012), which conceptualizes sustainability as the interaction of pedagogical, social, technological, organizational, and economic dimensions. This framework provided the analytical lens for examining how leadership, teacher professional learning, and collaborative school culture contributed to the long-term integration of mobile learning.

Research Questions

The study was guided by the following research questions:

1. How do the attitudes of key members of the school community (principal, teachers, students) towards mobile learning evolve from the initiation of the innovation to its later stages?
2. How do leadership actions and teachers' instructional practices unfold during the integration of mobile devices into teaching and learning?
3. What is the contribution of a school-based professional development program to teachers' pedagogical use of mobile technologies?
4. How can the trajectory of mobile learning integration be interpreted through a human-centered sustainability framework?

These questions were designed to capture both the processual nature of innovation and the multiple levels at which change occurred, including individual beliefs, pedagogical practices, organizational routines, and sustainability conditions.

Research Context and Participants

The research was conducted in a Greek experimental primary school located in a regional area. The school was selected through purposeful sampling (Patton, 2015), as it had expressed a strong commitment to pedagogical innovation and was willing to participate in a long-term research project within the constraints of the public education system.

Participants represented multiple members of the school community, including the school principal, classroom teachers, specialist teachers, students, parents, and the school education coordinator. Although data were collected from the broader school community, a core group of classroom teachers actively participated in the design, implementation, and evaluation of mobile learning activities throughout the three-year period.

Participation was voluntary, and informed consent was obtained from adult participants and from parents or legal guardians of participating students. Ethical considerations concerning anonymity, confidentiality, and responsible handling of research data were observed throughout the study.

Phases of the Research Design

Data collection and analysis were organized into three interconnected phases corresponding to the gradual development of the innovation. The first phase documented baseline attitudes and school conditions before implementation through questionnaires, vignettes, and student focus groups. The second phase focused on active implementation and professional development through participant observation, reflective field notes, interviews, classroom observations, and instructional artefacts. The third phase monitored sustainability during the second and third school years, examining how teachers maintained, adapted, or transformed mobile learning practices under everyday school conditions with reduced external support.

The school-based professional development program constituted a central component of both the innovation and the research design. Rather than relying on isolated external seminars, professional learning was embedded within the daily life of the school through a continuous cycle of collaborative planning, classroom experimentation, reflection, feedback, and redesign. Teachers gradually progressed from introductory workshops to co-designing lessons, implementing mobile learning activities independently, sharing classroom experiences, and collectively reflecting on pedagogical practices.

Data Collection

Methodological triangulation was achieved through the use of multiple qualitative data sources collected throughout the three-year study. Data included vignettes, questionnaires, semi-structured interviews, focus group interviews, participant observation, reflective field notes, research diaries, classroom artefacts, instructional materials, and school documentation. The combination of multiple sources enabled a comprehensive understanding of the implementation process while strengthening the credibility of the findings (Lincoln & Guba, 1985).

Data Analysis

All qualitative data were analyzed using thematic analysis (Braun & Clarke, 2021). The coding process was supported by ATLAS.ti software, which facilitated the organization, coding, comparison, and retrieval of qualitative data across the different phases of the study. Coding was conducted inductively, allowing themes to emerge from the data, while remaining theoretically informed by the human-centered sustainability framework proposed by Ng and Nicholas (2012). Attention was given to patterns related to attitudes, pedagogical practices, leadership actions, collaboration, professional learning, and sustainability challenges. To ensure ethical integrity, all participants were anonymized through systematic coding.

Findings

The findings revealed that the implementation and long-term sustainability of mobile learning resulted from the dynamic interaction of leadership, teacher professional learning, collaborative school culture, and pedagogical adaptation. Rather than following a linear trajectory, the innovation evolved progressively through continuous reflection, experimentation, and organizational learning.

Evolution of Teachers' Attitudes and Pedagogical Practices

Teachers' attitudes towards mobile learning changed considerably during the three-year implementation. Initial uncertainty, mainly associated with limited pedagogical confidence and lack of experience, gradually gave way to increased self-efficacy and willingness to integrate mobile technologies into everyday teaching.

Participation in the school-based professional development programme enabled teachers to move beyond using mobile devices for simple information retrieval towards designing collaborative, inquiry-based, and student-centred learning activities. As their pedagogical confidence increased, teachers demonstrated greater flexibility in selecting digital tools that aligned with curriculum objectives rather than using technology as an end in itself. These findings suggest that sustained professional learning played a decisive role in transforming teachers' beliefs and instructional practices.

Leadership and Collaborative School Culture

School leadership emerged as a critical factor influencing the implementation process. Rather than adopting a directive approach, leadership promoted collaboration, trust, and distributed responsibility among teachers. Teachers were encouraged to experiment, exchange ideas, reflect on classroom experiences, and jointly solve implementation challenges.

This collaborative environment strengthened collective ownership of the innovation and contributed to the gradual integration of mobile learning into everyday school practice. Leadership therefore functioned primarily as an enabling mechanism that supported organizational learning and continuous improvement.

Student Learning Experiences

Students consistently reported positive experiences throughout the implementation process. Mobile learning increased engagement, participation, collaboration, and motivation while supporting differentiated instruction and active learning. Students demonstrated increasing autonomy when using mobile technologies to investigate authentic problems, collaborate with peers, and create digital artefacts. Nevertheless, classroom observations also indicated that meaningful learning depended on careful pedagogical planning and teacher guidance rather than on technology alone.

Sustainability of Mobile Learning

The longitudinal nature of the study demonstrated that sustainability extended beyond the continued use of mobile devices. Sustainable implementation was reflected in the gradual incorporation of mobile learning into teachers' everyday pedagogical practices and the broader organizational culture of the school.

Although economic limitations, ageing equipment, and technological infrastructure remained persistent challenges, the innovation continued because teachers had internalized its pedagogical value and the school leadership maintained a supportive professional environment. Overall, the findings indicate that sustainability was primarily driven by human and organizational factors rather than by technological resources alone.

Discussion

The findings of this longitudinal case study demonstrate that the sustainable integration of mobile learning is fundamentally a human and organizational process rather than a technological one. Consistent with previous research, the availability of mobile devices alone did not lead to meaningful pedagogical change. Instead, sustainable implementation emerged through the interaction of leadership, teacher professional learning, collaborative school culture, and continuous pedagogical reflection (Fullan, 2016; Harris et al., 2022).

One of the most significant findings concerns the evolving role of teachers throughout the innovation process. Initially, many teachers perceived mobile technologies as supplementary instructional tools. However, sustained participation in school-based professional development gradually transformed both their pedagogical beliefs and classroom practices. This finding supports evidence suggesting that continuous, practice-oriented professional learning is considerably more effective than isolated technology training sessions in promoting lasting instructional change (Darling-Hammond et al., 2017; OECD, 2024).

The study also highlights the importance of distributed leadership in supporting educational innovation. Rather than directing implementation through top-down decisions, school leadership created conditions that encouraged collaboration, experimentation, and collective responsibility. Such leadership practices strengthened teachers' professional agency and contributed to the gradual institutionalization of mobile learning within everyday school practice. These findings reinforce contemporary perspectives that view leadership as a relational process enabling organizational learning and school improvement (Hargreaves & O'Connor, 2018; Harris et al., 2022).

From the perspective of the human-centered sustainability framework proposed by Ng and Nicholas (2012), the findings indicate that sustainability should be understood as a dynamic process of organizational adaptation rather than simply the continued use of digital devices. Although economic limitations and technological infrastructure remained important constraints, they did not prevent the continuation of the innovation. Instead, sustainability was primarily supported by teachers' commitment, collaborative professional culture, and leadership practices that reinforced pedagogical innovation.

The longitudinal design of the study offers an additional contribution to the literature. Whereas many studies evaluate technology integration during short-term implementation projects, this research followed the same school community over three academic years. This extended perspective provides richer evidence regarding how educational innovations evolve, stabilize, and gradually become embedded within school culture. Consequently, the study contributes empirical evidence to the growing body of research examining sustainability as an ongoing organizational and pedagogical process rather than a temporary project outcome.

Overall, the findings suggest that successful mobile learning initiatives require schools to move beyond technology adoption towards building organizational capacity, strengthening professional learning, and cultivating collaborative cultures capable of sustaining innovation over time.

Implications for Practice

The findings suggest that school leaders should prioritize sustained professional learning, collaborative planning, and distributed leadership when implementing mobile learning initiatives. Investment in digital infrastructure should be accompanied by continuous pedagogical support, enabling teachers to integrate mobile technologies meaningfully into everyday classroom practice. Policymakers should therefore consider sustainability as an organizational process requiring long-term capacity building rather than short-term technological investment.

Conclusion

This study explored the design, implementation, and long-term sustainability of mobile learning within a Greek experimental primary school through a three-year longitudinal qualitative case study. The findings demonstrate that sustainable mobile learning is achieved not through technology alone but through the combined influence of leadership, teacher professional learning, collaborative school culture, and continuous pedagogical adaptation.

By adopting a human-centered perspective, the study contributes empirical evidence showing that sustainability is an evolving organizational process shaped by the everyday practices and relationships of school communities. The findings extend current research by illustrating how educational innovation becomes gradually embedded within school culture through continuous collaboration, reflective practice, and distributed leadership.

Although the study is limited to a single case, its longitudinal design provides rich insights into the conditions that support sustainable innovation in primary education. Future research could examine similar initiatives across different educational contexts or investigate how educational policy can further support long-term digital transformation in schools.

The study ultimately suggests that the future of mobile learning depends less on technological investment than on schools' capacity to cultivate collaborative professional cultures, strengthen leadership, and sustain continuous teacher learning.

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

Generative AI tools were used prior to submission solely to improve the clarity, language, readability, and academic organization of the manuscript. The author takes full responsibility for the content of the paper. No generative AI tools were used for data collection, data analysis, or interpretation of results.

References

ATLAS.ti Scientific Software Development GmbH. (2024). *ATLAS.ti 24* [Computer software]. https://atlasti.com

Bachmair, B., & Pachler, N. (2015). Sustainability for innovative education: The case of mobile learning. *Journal of Interactive Media in Education, 2015*(1), 1–12. https://doi.org/10.5334/jime.ay

Blackmore, K. L., & Rønningsbakk, L. (2023). "Let us explain everything": Pupils' perspectives of the affordances of mobile technology during primary science inquiry. *Frontiers in Education, 8,* Article 1168459. https://doi.org/10.3389/feduc.2023.1168459

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2021). *Thematic analysis: A practical guide.* SAGE.

Crompton, H., & Burke, D. (2020). Mobile learning and pedagogical opportunities: A configurative systematic review of PreK–12 research using the SAMR framework. *Computers & Education, 156,* 103945. https://doi.org/10.1016/j.compedu.2020.103945

Crompton, H., & Burke, D. (2023). Mobile learning and student engagement: A systematic review. *Computers & Education, 191,* 104641. https://doi.org/10.1016/j.compedu.2022.104641

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development.* Learning Policy Institute.

Dorris, C., Winter, K., O'Hare, L., & Lwoga, E. T. (2024). Mobile device use in the primary school classroom and impact on pupil literacy and numeracy attainment: A systematic review. *Campbell Systematic Reviews, 20*(2), e1417. https://doi.org/10.1002/cl2.1417

Fullan, M. (2016). *The new meaning of educational change* (5th ed.). Teachers College Press.

Hargreaves, A., & O'Connor, M. (2018). *Collaborative professionalism: When teaching together means learning for all.* Corwin.

Harris, A., Jones, M., & Ismail, N. (2022). Distributed leadership: Taking a retrospective and contemporary view of the evidence base. *School Leadership & Management, 42*(5), 438–456. https://doi.org/10.1080/13632434.2022.2109620

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry.* SAGE.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey-Bass.

Ng, W., & Nicholas, H. (2012). A framework for sustainable mobile learning in schools. *British Journal of Educational Technology, 43*(5), 720–733. https://doi.org/10.1111/j.1467-8535.2012.01314.x

OECD. (2024). *Students, digital devices and success.* OECD Publishing. https://doi.org/10.1787/9e4c0624-en

OECD. (2025). *How's life for children in the digital age?* OECD Publishing. https://doi.org/10.1787/0854b900-en

Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed.). SAGE.

Prenger, R., Tappel, A. P. M., Poortman, C. L., & Schildkamp, K. (2022). How can educational innovations become sustainable? A review of the empirical literature. *Frontiers in Education, 7,* 970715. https://doi.org/10.3389/feduc.2022.970715

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

UNESCO. (2023). *Global education monitoring report 2023: Technology in education: A tool on whose terms?* UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000385723

Developing Creative Thinking Skills Through Philosophy for Children (P4C) in Middle School Mathematics Classes

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Abstract

The purpose of this research is to examine the effect of Philosophy for Children (P4C)-based instruction applied in middle school mathematics courses on students' mathematical creativity levels, specifically focusing on fluency, elaboration, and originality. An embedded mixed-methods design was adopted in the study. The quantitative phase utilized a quasi-experimental design with a pre-test and post-test control group, while the qualitative phase employed a case study design. The study group consisted of 40 fifth-grade students studying at a public school in Hatay, Turkey. Over an 8-week implementation period, the experimental group engaged in mathematics activities integrated with the P4C "Community of Inquiry" model, whereas the control group followed the standard mathematics curriculum. Data were collected using the Torrance Tests of Creative Thinking Figural Form B, a researcher-developed Mathematical Creative Thinking Skills Test, semi-structured interviews, and observation forms. Quantitative data were analyzed using Mixed-Design ANOVA, and qualitative data were analyzed via content analysis. The quantitative findings revealed a statistically significant increase in the mathematical creativity scores (fluency, originality, resistance to premature closure, and emotional expressiveness) of the experimental group compared to the control group. Qualitative findings supported these results, showing that P4C transformed the classroom into an active community of inquiry where students could freely express their thoughts, draw inspiration from peer ideas, and generate multiple alternative solutions in a safe environment. Consequently, the P4C approach proved to be a highly effective pedagogical tool for enhancing mathematical creativity.

Keywords: philosophy for children, mathematical creativity, mathematics education, middle school, creative thinking

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Introduction

The pedagogical transformation in mathematics education emphasizes shifting students from passive recipients of knowledge to active constructors who can solve complex problems and develop alternative thinking pathways. However, the traditional perception of mathematics, which often focuses on finding a single correct answer, limits students' capacity to approach problems in an original, flexible, and fluent manner. Mathematical creativity requires students to overcome mental blocks when faced with a problem, utilizing mental flexibility to produce multiple, previously non-existent solutions based on fluency, originality, and elaboration.

The Philosophy for Children (P4C) approach aims to develop students' critical, creative, caring, and collaborative thinking skills through the “Community of Inquiry” model. The safe atmosphere of P4C, which eliminates the fear of judgment, reduces speaking anxiety and supports self-confidence, empathy, and the ability to generate alternative hypotheses. In this context, this study examines the effects of the P4C approach on middle school students' mathematical creativity to contribute to the cultivation of generations who think critically and go beyond conventional patterns rather than merely memorizing formulas.

Furthermore, there is a direct cognitive link between the philosophical inquiry steps of P4C and the cognitive dimensions of mathematical creativity. According to Lipman's constructivist philosophical framework, continuous questioning and brainstorming practices directly increase students' volume of idea generation, which corresponds to the “fluency” dimension of creativity. Similarly, the “Community of Inquiry” encourages students to examine alternative hypotheses and listen to different perspectives, thereby breaking mental rigidities and fostering “flexibility” and “originality.” Despite these theoretical links, experimental studies examining the direct effect of the P4C approach on mathematical creativity remain quite limited in the international literature. While existing research predominantly focuses on critical thinking, problem-solving, mathematical reasoning, and general academic achievement, studies centering specifically on the fluency, flexibility, and originality dimensions of mathematical creativity are relatively scarce. Therefore, this study aims to fill this theoretical gap by concretizing the conceptual connection between philosophical inquiry processes and mathematical reasoning.

Methodology

This research was conducted using an embedded mixed-methods design, which integrates quantitative and qualitative data. In this design, qualitative data were embedded within a quantitative quasi-experimental design (pre-test and post-test control group) to deeply understand the mechanism of the experience and the participants' processes. The study group consisted of 40 fifth-grade students attending a public middle school in Hatay, Turkey. Existing intact classes were randomly assigned to the groups, resulting in 20 students in the experimental group (10 girls, 10 boys) and 20 students in the control group (10 girls, 10 boys).

The research process was structured in four main stages: preparation, pre-test, experimental implementation, and post-test. Initially, the Torrance Tests of Creative Thinking Figural Form B and the researcher-developed Mathematical Creative Thinking Skills Test were administered as pre-tests. During the 8-week experimental procedure, mathematics topics (Fractions, Decimal Notation, and Data Processing) were taught in the experimental group using the P4C “Community of Inquiry” model. This involved presenting philosophical stimuli (e.g., excerpts from children's literature, math-themed stories), generating questions, and conducting

collaborative dialogues in a circular seating arrangement. Conversely, the control group received traditional instruction based on teacher-centered explanations and routine problem-solving according to the existing curriculum.

At the end of the 8 weeks, the same tests were administered as post-tests. In addition, semi-structured interviews were conducted with 10 students from the experimental group. Furthermore, student behaviors were continuously assessed using observation forms evaluated by two independent experts. Quantitative data were analyzed utilizing Mixed-Design ANOVA to determine the main and interaction effects, while qualitative data obtained from interviews and observations were subjected to systematic content analysis.

Results and Discussion

Quantitative Findings

The Mixed-Design ANOVA results for the Torrance Tests of Creative Thinking revealed statistically significant interaction effects favoring the experimental group in multiple dimensions. While the fluency pre-test mean score of the experimental group was 7.05, it significantly increased to 11.68 in the post-test [$F(1, 38) = 5.019$, $p = .031$]. Similarly, the experimental group's originality score rose from 5.45 to 14.95, indicating a remarkable improvement compared to the control group [$F(1, 38) = 11.230$, $p = .002$]. Significant interaction effects favoring the experimental group were also observed in the dimensions of resistance to premature closure [$F(1, 38) = 11.701$, $p = .002$] and emotional expressiveness [$F(1, 38) = 26.796$, $p < .001$]. However, the interaction effect for the elaboration dimension was not statistically significant [$F(1, 38) = 0.362$, $p = .551$].

The Mathematical Creative Thinking Skills Test results further confirmed these improvements. The experimental group showed a highly significant increase in general creativity scores, yielding a very large effect size ($\boldsymbol{\eta}^2 = .827$) [$F(1, 36) = 171.676$, $p < .001$]. Specifically, mathematical fluency scores increased from 2.48 to 3.55 in the experimental group, while the control group only shifted from 2.14 to 2.28 [$F(1, 36) = 98.302$, $p < .001$]. In the mathematical originality dimension, the experimental group's scores jumped from 2.33 to 3.48, compared to a minimal increase (2.17 to 2.42) in the control group [$F(1, 36) = 41.386$, $p < .001$]. Even in the mathematical elaboration dimension, where the Torrance Test showed no significant difference, the experimental group demonstrated a substantial increase (from 2.33 to 3.50) compared to the control group (from 2.11 to 2.14), revealing that P4C effectively fosters elaboration in mathematical contexts [$F(1, 36) = 156.203$, $p < .001$].

Qualitative Findings

The content analysis of the semi-structured interviews and observations revealed that students' development clustered around four main themes: “Fluency,” “Flexibility,” “Originality,” and “Elaboration.” Observation data indicated that at the beginning of the process, students mostly relied on standard algorithms and avoided complex multi-step problems. However, starting from the fourth week, as the philosophical dialogues deepened, the experimental group reached peak performance levels (2.90–3.00 out of 3.00) in generating independent solutions and viewing mistakes as learning opportunities.

Student interviews provided concrete evidence of this transformation. For instance, in the originality dimension, Student 20 (Ö20) initially provided a standard, restrictive answer to an

alternative mathematics system question during the pre-test. Following the P4C interventions, the same student successfully constructed an unconventional, unique rule system in the post-test. Similarly, in the elaboration dimension, Student 17 (Ö17) initially provided very brief, result-oriented answers. However, during the post-test, the student expanded their reasoning step-by-step, providing strong justifications and enriching their mathematical arguments with detailed scenarios. These findings indicate that the "Community of Inquiry" effectively removes the pressure of finding a single correct answer, encouraging students to freely express and elaborate on their original thoughts.

Conclusion

The findings indicate that P4C-based mathematics instruction is a highly effective pedagogical tool for enhancing students' mathematical creativity compared to traditional teaching methods. The P4C process successfully transformed the classroom from a routine calculation environment into an active, democratic "mathematical community of inquiry." By eliminating the pressure of finding a single correct answer, the intervention supported students in generating alternative solution strategies, questioning assumptions, and constructing their own cognitive processes. This research provides a practical and integrable "mathematical philosophical inquiry" model for curriculum designers and mathematics educators to foster creative thinking in middle school classrooms.

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

I declare that Gemini, an AI-assisted tool, was used in translating the manuscript into English and refining the language. The usage was limited to translation, correcting grammatical and spelling errors, and rephrasing statements for accuracy and clarity in English. I further declare that, apart from this, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from my careful and systematic conduct of the research.

References

Çetin, İ., & Çetin, H. (2023). Matematik eğitiminde Çocuklar için Felsefe (P4C) uygulamaları: Matematik hikayeleri örneği [Philosophy for Children (P4C) applications in mathematics education: The example of math stories]. *Kaygı: Bursa Uludağ Üniversitesi Fen-Edebiyat Fakültesi Felsefe Dergisi, 22*(3), 515–558. https://doi.org/10.20981/kaygi.1338302

Çırak, S., & Uygun, T. (2023). Teknoloji destekli etkinliklerle zenginleştirilmiş matematik öğretiminin özel yetenekli öğrencilerin matematik başarısına etkisi: Deneysel çalışma [The effect of mathematics teaching enriched with technology-supported activities on the mathematics achievement of gifted students: An experimental study]. *Eğitimde Kuram ve Uygulama, 19*(2), 355–369. https://doi.org/10.17244/eku.1264051

Daniel, M. F. (2008). Learning to philosophize: Positive impacts and pedagogical prerequisites. In *Philosophy in schools* (pp. 41–52). Routledge.

Demissie, F., Povey, H., & Adams, G. (2019). What are the affordances and limitations of the philosophy for Children (P4C) pedagogy for teaching and learning mathematics? *Proceedings of the British Society for Research into Learning Mathematics (BSRLM), 39*(1).

Haylock, D. (1997). Recognising mathematical creativity in schoolchildren. *ZDM – Mathematics Education, 29*(3), 68–74.

Leikin, R. (2009). Exploring mathematical creativity using multiple solution tasks. In R. Leikin, A. Berman, & B. Koichu (Eds.), *Creativity in mathematics and the education of gifted students* (pp. 129–145). Sense Publishers.

Lipman, M. (2003). *Thinking in education* (2nd ed.). Cambridge University Press.

Sriraman, B. (2004). The characteristics of mathematical creativity. *The Mathematics Educator, 14*(1), 19–34.

Torrance, E. P. (1974). *Torrance tests of creative thinking*. Scholastic Testing Service.

Zulkifli, H., & Hashim, R. (2020). Philosophy for Children (P4C) in improving critical thinking in a secondary moral education class. *International Journal of Learning, Teaching and Educational Research, 19*(2), 29–45.

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Investigating Preservice Teachers' Perceptions of Interdisciplinary Pedagogies in an Innovative Elementary Teacher Preparation Program

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Abstract

Elementary teachers must teach across content areas to foster student interest, deepen understanding, and prepare learners for the world. Teacher education programs, therefore, should equip preservice teachers (PSTs) with the knowledge for implementing interdisciplinary instruction. This study examines PSTs' reflections on interdisciplinary teaching in an innovative university teacher preparation program in New Jersey, USA, focusing on their conceptions, confidence, and perceived challenges. PSTs in the program complete five courses in each of four content areas, along with pedagogy coursework. In their senior year, PSTs take a semester-long interdisciplinary capstone course, co-taught by two professors, where they learn interdisciplinary teaching strategies and design interdisciplinary units. Reflections were collected at the conclusion of the capstone course over a two-year period, focusing on participants' understanding, conceptions, and confidence regarding interdisciplinary teaching. The data were analyzed using coding and thematic interpretation, with credibility supported through peer review and investigator triangulation. Thematic analysis of reflections showed that PSTs initially had limited understanding of interdisciplinary teaching and unit design. By the end of the capstone course, they reported increased confidence and readiness to implement interdisciplinary instruction, attributing growth to exploring connections across content areas and various social and global topics. These findings underscore the importance of teacher preparation in developing interdisciplinary teaching strategies. Nonetheless, PSTs identified challenges related to aligning standards across disciplines, instructional practicality, administrative and parental expectations, and assessment. This study illustrates program-wide interdisciplinary teacher preparation and identifies ways to strengthen preservice teachers' pedagogical and dispositional readiness.

Keywords: interdisciplinary, elementary teacher, teacher preparation, preservice teachers

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Introduction

Learning opportunities during the elementary grades play a crucial role in students' early cognitive and social development and in their success in later years (Bennett, 1986). Therefore, elementary teachers play a vital role in supporting students' development of foundational content knowledge and motivation to learn (Ekmekci & Serrano, 2022; Fauth et al., 2019; Fennema & Franke, 1992; Hairrell et al., 2011). Elementary teachers must teach across content areas to foster student interest, deepen understanding, and prepare learners for the world. Teacher education programs, therefore, should equip preservice teachers (PSTs) with the knowledge for implementing interdisciplinary instruction.

Recent research has provided evidence of the observable benefits of interdisciplinary education (An, 2017; Brand & Triplett, 2012; Santau & Ritter, 2013). By connecting different areas of study, interdisciplinary education aims to facilitate greater conceptual understanding among students than if they had learned the content of each subject in isolation (Brand & Triplett, 2012; Campbell & Henning, 2010; Gerke, 2017). However, reports on interdisciplinary programs in schools have been and remain limited, and there is a lack of adequate research or guidance on methods (Lagemann & Shulman, 1999; Warkentien et al., 2022; Wood, 2015). Teacher preparation is critical in developing pedagogical content knowledge (PCK) for this interdisciplinary teaching approach.

Not all elementary education programs prepare pre-service teachers (PSTs) in the same way. Although teacher education associations provide extensive recommendations on the types of content knowledge, teaching skills, and dispositions that elementary PSTs need to develop, each program interprets those recommendations differently (Bezuk et al., 2017; Morrell et al., 2020). Scholars have called for more opportunities for teacher preparation and a more thorough examination of how pre-service teacher preparation affects the implementation and impacts of interdisciplinary education (Harrison et al., 2020).

Following recent recommendations in the literature, this study explores PSTs' discussions and reflections on interdisciplinary teaching approaches within an innovative interdisciplinary elementary teacher education program in New Jersey, USA, focusing on their conceptions, confidence, and perceived challenges.

The following research questions (RQs) guide this study:

1. In what ways do PSTs in an elementary education program reflect on interdisciplinary teaching pedagogies?
2. Which challenges do PSTs in an elementary education program recognize about interdisciplinary teaching pedagogies?

Theoretical Framework

Knowledge and Quality of Teaching Practice

Elementary teacher education programs in the U.S. vary in their required coursework and teaching experiences for candidates. Professional and subject-specific standards guide these programs to ensure a comprehensive education. The National Board for Professional Teaching Standards [NBPTS] (2012) recommends 10 standards for teachers of students ages 3–10, emphasizing subject-matter knowledge in language and literacy, mathematics, science, and social studies (Darling-Hammond, 2008).

Developing subject matter knowledge during preservice education supports PSTs' PCK and the quality of their teaching practices (König & Pflanzl, 2016; Morris & Hiebert, 2017). Teacher knowledge in literature has been defined in relation to Shulman's concept of PCK, underlying interrelationships between subject matter and pedagogical knowledge, and their intersection (McEwan & Bull, 1991; Shulman, 1986). Researchers have used various measures to assess teacher content knowledge (Blömeke & Delaney, 2012). Praxis tests are among the measures used to evaluate PSTs' knowledge of teaching (Mikeska et al., 2018; Phelps et al., 2020).

The quality of teaching practice is described in terms of teachers' essential knowledge, skills, and dispositions regarding curriculum, cultures, and the social context of teaching, and is measured with standardized tests, observations, and rubrics (Chen et al., 2011; Gore et al., 2017; Hollins, 2011). Educative Teacher Performance Assessment (edTPA) is one of the performance-based measures used to evaluate PSTs' quality of teaching in terms of planning, instruction, and assessment for student learning (Sato, 2014; Youngs & Whittaker, 2016).

Interdisciplinary Teaching Pedagogies

Although several definitions of interdisciplinary education use slightly different language, commonalities across these definitions point to an emerging consensus (Moser et al., 2020; National Academy of Sciences, 2004; Newell, 2013). Interdisciplinary education focuses on a topic, theme, or problem, reflecting the natural relationship between different disciplines of knowledge. At the same time, multidisciplinary instruction combines information from different disciplines and reports only at the end, or integrated instruction incorporates one subject within others (Wood, 2015). PSTs need to develop appropriate conceptions and confidence about the specific ways of interdisciplinary education to plan this way.

PSTs' Conceptions and Confidence in Interdisciplinary Teaching

Teachers have not been educated as students in interdisciplinary ways, have little training in designing interdisciplinary units, and may not feel prepared to extend beyond their disciplinary expertise (Wang et al., 2020; Wu et al., 2021). In addition, teachers' conceptions, motivation, and confidence in teaching interdisciplinary content are essential considerations in determining whether they are ready for this pedagogy (Applebee et al., 2007).

Harrison and colleagues (2020) have called for a more thorough examination of how PST preparation affects the implementation and impacts of interdisciplinary education. As noted by Havice et al. (2018), an interdisciplinary (or integrated) approach cannot occur overnight, particularly not without thoughtful training for future teachers. Superficial connections result partly from teachers' discomfort or unfamiliarity with the subject matter. To examine these discomforts, it is important to look into PSTs' reflections and understand their perceptions of interdisciplinary teaching approaches and challenges in implementing these pedagogies.

Interdisciplinary Program and Capstone Course

Principles of the Interdisciplinary Program

The interdisciplinary major offers substantial university-level coursework to better prepare future elementary teachers in each of the four subject areas they will teach. The curriculum includes five courses in mathematics, five in science, six in reading and language arts, and nine

in social studies. Fifteen or more credit hours in each of these areas help prepare future teachers to be highly qualified in all areas, including helping students prepare to pass all four required subject-area PRAXIS II exams. Elementary teachers with high proficiency across all subject areas are better equipped to help their students meet learning outcomes aligned with the standards.

The curriculum was constructed with reference to relevant standards and recommendations made by professional organizations. Some of these include the Common Core Standards in Mathematics (CCSS-M), the National Council of Teachers of Mathematics (NCTM), Next Generation Science Standards (NGSS), and the PRAXIS II social studies and reading/language arts content. Also, the major is a cooperative endeavor involving Arts and Sciences units and the School of Education. The program's content-area courses are delivered by Arts and Sciences departments and faculty and augmented by pedagogy-focused courses in mathematics, science, language arts, and social studies. Methods courses outside the major are delivered by School of Education faculty. Its capstone course is delivered by both the Arts and Sciences and the School of Education faculty. Program administration is housed in the Department of Curriculum and Instruction within the School of Education.

Effectiveness of Interdisciplinary Elementary Teacher Preparation

Elementary teachers' preparation to teach science or social studies in K–6 grades is also limited. In her survey study, Trygstad et al. (2013) found that fewer than half of teacher education programs offered at least one course in physics or chemistry, whereas the majority of required science coursework was in life and earth sciences. The image of elementary teacher preparation for social studies is not very different (Mimbs, 2002; Passe, 2006; Womac, 2014). Mimbs (2002) found that 32% of the programs that participated in her study did not require a geography course within their elementary teacher education programs. The status of geography courses within the elementary teacher education curriculum was even worse in 2014; Womac (2014) also found that 87% of the undergraduate elementary teacher education programs did not require their teacher candidates to take a geography course.

In light of these reports and studies, we believe the Interdisciplinary Studies for Elementary Educators undergraduate program, a 120-credit interdisciplinary degree, provides sound content preparation for elementary teacher candidates through its balanced curriculum and coursework that focus on breadth, depth, and interdisciplinary aspects of English language arts, mathematics, science, and social studies. In their senior year, PSTs take a semester-long interdisciplinary capstone course, co-taught by two professors, where they learn interdisciplinary teaching strategies and design interdisciplinary units.

Interdisciplinary Program's Capstone Course

In their senior year, PSTs take a semester-long interdisciplinary capstone course, co-taught by two professors, where they learn interdisciplinary teaching strategies and design interdisciplinary units. The teacher candidates will have completed most of their content-area courses and many of their content-based methods courses, which provide a foundation for learning interdisciplinary teaching methods. Its capstone course, by design, is to be taught jointly by one faculty member from a content-area discipline and the other from the education area. Each semester the course is taught, a broad theme is chosen. Example themes include social justice, the environment, bullying, climate change, poverty, and urbanization.

The course is divided into smaller sections: the first section introduces the interdisciplinary teaching method. The class has a chance to read about the method. The second section of the course is about six weeks in length. During this time, a series of speakers are invited to speak with the class. These lessons provide teacher candidates with the opportunity to see how a single theme can be understood and taught from multiple perspectives, illustrating its interdisciplinary potential. The third section covers about five weeks of the course, during which students read more about designing interdisciplinary lessons and preparing an interdisciplinary unit plan. The key parts in this section are a cross-curricular study and creating a web design of their interdisciplinary unit plans about a topic they choose. The web designs help PSTs connect disciplines to the topic and to each other. Finally, each PST writes a unit plan and lesson plans and presents them as micro teaching.

Methodology

Reflections were collected at the conclusion of the capstone course over a two-year period, focusing on participants' understanding, conceptions, and confidence regarding interdisciplinary teaching. The data were analyzed using coding and thematic interpretation, with credibility supported through peer review and investigator triangulation. Thematic analysis of reflections showed that PSTs initially had a limited understanding of interdisciplinary teaching and unit design.

We used qualitative methods as the primary methodology (Creswell & Plano Clark, 2017) to analyze capstone course data from 28 PSTs enrolled in IS-410 during the fall 2020 and 2021 semesters at the end of each semester. The reflections included five questions about PSTs' understanding, conceptions, and confidence in interdisciplinary teaching (see Figure 1).

Figure 1
End-of-Semester Reflection Prompts

1) Prior to this course (IS-410), how familiar were you with the interdisciplinary teaching model? Explain.
2) After taking this course, how much prepared do you feel to teach an interdisciplinary lesson in your own classroom? Explain.
3) In making the Unit Plan for teaching issues, did you feel you had the necessary content knowledge to research your topic? Explain.
4) In your opinion, how could the interdisciplinary unit plan project assist with the development of knowledge, skills or attitudes in teacher training (in any aspects, i.e., social justice, interdisciplinary instruction, personal preconception and bias, perspectives on the local and global issues)?
5) In doing the interdisciplinary unit plan project, what challenges or questions did you (or still) have?

We analyzed PSTs' reflections by developing coding and interpreting themes and sub-categories (Ary et al., 2002). For credibility, peer review and investigator triangulation were used (Eisner, 1998).

Results and Discussions

By the end of the capstone course, PSTs reported increased confidence and readiness to implement interdisciplinary instruction, attributing growth to exploring connections across content areas and various social and global topics. These findings underscore the importance of teacher preparation in developing interdisciplinary teaching strategies. Nonetheless, PSTs identified challenges related to aligning standards across disciplines, instructional practicality, administrative and parental expectations, and assessment. **Table 1** shows the prompt question numbers, a summary of those students' responses, and our qualitative interpretations.

Table 1
Themes, Subcodes, and Exemplary Quotes From PSTs' Reflections

Major Themes	Sub-codes	Exemplary Quotes
Familiarity with Interdisciplinary Teaching Pedagogies	• Overall unfamiliarity • Surface-level familiarity • Previous course experience • Previous class observation	*In field placements, I had seen how some teachers incorporated science or social studies into reading and language arts instruction since the two subjects were either not taught each day or only for a short amount of time.* (PST14, subcode: Previous class observation)
Preparedness to Teach Interdisciplinary Lessons	• Limited preparedness due to a lack of interdisciplinary teaching experience • Preparedness as a result of course assignments • Preparedness as a result of online course content	*Also, the unit plan prepared me to teach one main social justice topic and break it down into different parts, within different subject areas.* (PST2, subcode: Preparedness as a result of course assignments)
Confidence in PSTs' own Interdisciplinary Content Knowledge	• Limited confidence in some content more than others • Limited confidence in identifying relevant topics for interdisciplinary teaching • Confidence in content as a result of previous content courses	*I believe that I focused more on English or language arts because I feel that this content area is the easiest to base my other lessons off of as a base.* (PST18, subcode: Limited confidence in some contents more than others)

	• Confidence in content as a result of guest instructors	
Overall Reflections on the Interdisciplinary Seminar Course	• Learning to connect multiple subjects • Learning to teach content around real-world topics • Learning pedagogical strategies in lesson/unit planning	*[We] should be informed by content across all disciplines on how to teach issues and how to connect them because elementary educators are usually teaching all subjects in their schools.* (PST13, subcode: Learning to connect multiple subjects)
Challenges Perceived about Interdisciplinary Teaching	• Difficulty in aligning multiple contents with relevant standards • Questioning the practicality • Concerns about administrative support and parental expectations • Difficulty regarding assessments	*From my observations, especially as a new teacher, you have to follow the curriculum; therefore, this model would be incredibly hard to follow in the first few years of teaching.* (PST6, subcode: Questioning the practicality)

18 out of 28 (64%) PSTs indicated familiarity with the interdisciplinary teaching model. However, those who cited their familiarity only revealed surface-level knowledge and conceptions of interdisciplinary teaching approaches. 22 (79%) and six (21%) PSTs felt prepared and somewhat prepared to teach an interdisciplinary lesson in their field placements, respectively. All but one PST (96%) reported being confident in the content knowledge necessary to teach multiple subjects. In explaining their confidence, PSTs cited their experience in this capstone course and how it helped them explore connections among multiple content areas and real-world topics to motivate elementary students' learning across subjects.

Our analysis revealed four main challenges about interdisciplinary teaching pedagogies: i) aligning multiple contents with relevant standards, ii) the practicality, iii) administrative support and parental expectations, and iv) assessments. While PSTs described their gains as a result of the course assignments (i.e., interdisciplinary unit plan), they still highlighted that identifying relevant standards to connect multiple subject areas was the most prominent challenge.

Significance of the Study

It is critical for elementary teachers to provide opportunities for their students and to "teach across content areas to model, respond, and prepare students for the world in which they live," addressing the challenges they face globally (Boche et al., 2021, p. 15). In that respect, teacher education programs need to be developed to prepare competent future elementary teachers in

all content areas and to be pedagogically insightful about how to design and teach an interdisciplinary curriculum.

Our study illustrates program-wide interdisciplinary teacher preparation and identifies ways to strengthen preservice teachers' pedagogical and dispositional readiness. PSTs in IS-410 reflected that they had limited experience or knowledge of what interdisciplinary teaching means and how an interdisciplinary unit or lesson plan is created. However, after taking the capstone course, PSTs indicated strong confidence and felt prepared for interdisciplinary teaching in their future classroom. These findings assure how critical teacher preparation is in developing PCK and conceptions for interdisciplinary teaching strategies (Harrison et al., 2020). Some challenges were also perceived regarding interdisciplinary teaching pedagogies, commonly identified among PSTs in other studies (Warkentien et al., 2022; Wood, 2015).

Our study presents a concrete example of a program-wide implementation of teacher training for interdisciplinary elementary education and resulting teacher outputs. Building on our results, teacher educators identify additional ways to improve PSTs' knowledge across all content areas and their pedagogical and dispositional readiness for interdisciplinary teaching.

References

An, S. A. (2017). Preservice teachers' knowledge of interdisciplinary pedagogy: the case of elementary mathematics–science integrated lessons. *ZDM*, *49*(2), 237–248.

Applebee, A. N., Adler, M., & Flihan, S. (2007). Interdisciplinary curricula in middle and high school classrooms. *American Educational Research Journal, 44*(4), 1002–1039.

Ary, D., Jacobs, L. C., & Razavieh, A. (2002). *Introduction to research in education* (6th ed). Wadsworth Thomson Learning.

Bennett, W. J. (1986). *First lessons: A report on elementary education in America*. US Department of Education.

Bezuk, N., Bay-Williams, J., Clements, D. H., Martin, W. G., Aguirre, J., Boerst, T., Burroughs, E. A., Dickey, E., Hughes, E., Huinker, D., Gutierrez, R., Karp, K., Lewis, J., Olson, T. A., Philipp, R., Rigelmann, N., Strutchens, M. E., White, D. Y., & Thomas, C. D. (2017). *AMTE standards for mathematics teacher preparation*. AMTE.

Blömeke, S., & Delaney, S. (2012). Assessment of teacher knowledge across countries: A review of the state of research. *ZDM*, *44*(3), 223–247.

Boche, B., Bartels, S., & Wassilak, D. (2021). Reimagining an elementary teacher education preparation program: Striving for integrated teaching. *Educational Considerations*, *47*(1), n1.

Brand, B. R., & Triplett, C. F. (2012). Interdisciplinary curriculum: An abandoned concept? *Teachers and Teaching, 18*(3), 381–393.

Campbell, C., & Henning, M. B. (2010). Planning, teaching, and assessing elementary education interdisciplinary curriculum. *International Journal of Teaching and Learning in Higher Education*, *22*(2), 179–186.

Chen, W., Hendricks, K., & Archibald, K. (2011). Assessing pre-service teachers' quality teaching practices. *Educational Research and Evaluation*, *17*(1), 13–32.

Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research*. Sage Publications.

Darling-Hammond, L. (2008). Knowledge for teaching: What do we know? In M. Cochran-Smith, S. Feiman-Nemser & D. J. Mclntyre (Eds.), *Handbook of research on teacher education* (3rd ed.) (pp. 1316–1323). Routledge.

Eisner, E. W. (1998). *The enlightened eye: Qualitative inquiry and the enhancement of educational practice*. Merrill/Prentice-Hall.

Ekmekci, A., & Serrano, D. M. (2022). The impact of teacher quality on student motivation, achievement, and persistence in science and mathematics. *Education Sciences*, *12*(10), 649.

Fauth, B., Decristan, J., Decker, A. T., Büttner, G., Hardy, I., Klieme, E., & Kunter, M. (2019). The effects of teacher competence on student outcomes in elementary science education: The mediating role of teaching quality. *Teaching and Teacher Education*, *86*, 102882.

Fennema, E., & Franke, M. L. (1992). Teachers' knowledge and its impact. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 147–164). Macmillan.

Gerke, A. G. (2017). *Interdisciplinary education in the elementary curriculum: Exploring teacher perceptions and practices*. [Unpublished master's thesis]. Ontario Institute for Studies in Education of the University of Toronto.

Gore, J., Lloyd, A., Smith, M., Bowe, J., Ellis, H., & Lubans, D. (2017). Effects of professional development on the quality of teaching: Results from a randomised controlled trial of Quality Teaching Rounds. *Teaching and Teacher Education*, *68*, 99–113.

Hairrell, A., Rupley, W. H., Edmonds, M., Larsen, R., Simmons, D., Willson, V., Byrns, G., & Vaughn, S. (2011). Examining the impact of teacher quality on fourth-grade students' comprehension and content-area achievement. *Reading & Writing Quarterly*, *27*(3), 239–260.

Harrison, L. M., Hurd, E., & Brinegar, K. (Eds.). (2020). *Integrative and interdisciplinary curriculum in the middle school: Integrated approaches in teacher preparation and practice*. Routledge Research in Education.

Havice, W., Havice, P., Waugaman, C., & Walker, K. (2018). Evaluating the effectiveness of integrative STEM education: Teacher and administrator professional development. *Journal of Technology Education, 29*(2), 73–90.

Hollins, E. R. (2011). Teacher preparation for quality teaching. *Journal of Teacher Education*, *62*(4), 395–407.

König, J., & Pflanzl, B. (2016). Is teacher knowledge associated with performance? On the relationship between teachers' general pedagogical knowledge and instructional quality. *European Journal of Teacher Education*, *39*(4), 419–436.

Lagemann, E. C., & Shulman, L. S. (1999). Issues in educational research: Problems and possibilities. San Francisco: Jossey-Bass.

McEwan, H., & Bull, B. (1991). The pedagogic nature of subject matter knowledge. *American Educational Research Journal*, *28*(2), 316–334.

Mikeska, J. N., Kurzum, C., Steinberg, J. H., & Xu, J. (2018). Assessing elementary teachers' content knowledge for teaching science for the ETS® educator series: Pilot results. *ETS Research Report Series*, *2018*(1), 1–30.

Mimbs, C. (2002). Leadership Development as Self-Development: An Integrated Process. *Action in Teacher Education*, *24*(3), 20–25. https://doi.org/10.1080/01626620.2002.10734427

Morrell, P., Rogers, M. P., Pyle, E., Roehring, G., & Veal, W. (2020). *2020 NSTA/ASTE standards for science teacher preparation*. ASTE.

Morris, A. K., & Hiebert, J. (2017). Effects of teacher preparation courses: Do graduates use what they learned to plan mathematics lessons?. *American Educational Research Journal*, *54*(3), 524–567.

Moser, K. M., Ivy, J., & Hopper, P. F. (2020). Rethinking content teaching at the middle level: An interdisciplinary approach, In L. M. Harrison, E. Hurd, & K. Brinegar (Eds.), *Integrative and interdisciplinary curriculum in the middle school: Integrated approaches in teacher preparation and practice.* Routledge Research in Education.

National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. (2004). *Facilitating interdisciplinary research.* The National Academies Press.

National Board for Professional Teaching Standards. (2012). *Early childhood generalist standards for teachers of students ages 3-10* (3rd ed.). National Board for Professional Teaching Standards.

Newell, W. H. (2013). The state of the field: Interdisciplinary theory. *Issues in Interdisciplinary Studies, 31*, 22–43.

Passe, J. (2006). New challenges in elementary social studies. *Social Studies*, *97*, 189–192.

Phelps, G., Steinberg, J., Leusner, D., Minsky, J., Castellano, K., & McCulla, L. (2020). Praxis® content knowledge for teaching: Initial reliability and validity results for elementary reading language arts and mathematics. *ETS Research Report Series*, *2020*(1), 1–44.

Santau, A. O., & Ritter, J. K. (2013). What to teach and how to teach it: Elementary teachers' views on teaching inquiry-based, interdisciplinary science and social studies in urban settings. *The New Educator, 9*(4), 255–286.

Sato, M. (2014). What is the underlying conception of teaching of the edTPA? *Journal of Teacher Education*, *65*(5), 421–434.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(2), 4–14.

Trygstad, P. J., Smith, P. S., Banilower, E. R., & Nelson, M. M. (2013). *The status of elementary science education: Are we ready for the Next Generation Science Standards?* Horizon Research. https://files.eric.ed.gov/fulltext/ED548249.pdf

Wang, H. H., Charoenmuang, M., Knoblock, N. A., & Tormoehlen, R. L. (2020). Defining interdisciplinary collaboration based on high school teachers' beliefs and practices of STEM integration using a complex designed system. *International Journal of STEM Education, 7*(3).

Warkentien, S., Goeking, J., Dilig, R., Knapp, L., & Stanley, R. (2022). *Interdisciplinary education: Literature review and landscape analysis.* Lucas Education Research International.

Womac, P. (2014). The unfortunate status of geography in elementary teacher education: A call for discourse. *Research in Geographic Education, 16*(2), 46–60.

Wood, K. (2015). *Interdisciplinary instruction: Unit and lesson planning strategies K-8* (5th ed). Waveland Press, Inc.

Wu, Y., Cheng, J., & Koszalka, T. A. (2021). Transdisciplinary approach in middle school: A case study of co-teaching practices in STEAM teams. *International Journal of Education in Mathematics, Science and Technology, 9*(1), 138–162.

Youngs, P., & Whittaker, A. (2016). The role of edTPA in assessing content-specific instructional practices. In P. Youngs & J. Grissom (Eds.), *Improving teacher evaluation systems: Making the most of multiple measures* (pp. 37–50). Teachers College Press.

Impact Study of Professional Salesmanship Course to the Learning Experiences, Student Learning and Learner Diversity of the Business Graduates

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Abstract

This research study focused on the impact of the course Professional Salesmanship on the Bachelor of Science in Business Administration major in Marketing Management. This is a program that produces well-rounded, globally competitive graduates equipped with the knowledge to cover specific areas in marketing. The program covers areas including professional salesmanship and sales management. This study helped the students recognize selling as a career. Making them realized the participation of each element in getting the desired output in the sales organization. This study is to determine the impact of a course on the economic life, which can be considered as the economic value of an individual's life, which can be calculated by considering one's yearly income. This study led to Holistic Student Development in school education. It refers to an approach that seeks to foster all aspects of a child's progress and well-being. It emphasizes students' physical, intellectual, emotional, social, and moral growth. The key features of holistic learning include educating the whole student, viewing students as part of the whole, embracing a caring classroom culture, and engaging in experiential learning. The research employed a quantitative research methodology with a descriptive approach to investigate the impact of the course Professional salesmanship to the economic life of the BSBA Marketing Management students. This method allowed the analysis of statistically significant relationships and generalized findings on their perceptions and engagement. To achieve this, a rigorously designed survey will be administered, containing a combination of closed-ended and Likert-scale questions.

Keywords: learner diversity, student learning, learning experiences

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Introduction

One of the thrusts for every higher academic institution in the Philippines is to deliver quality higher education to its stakeholders, with a particular focus on student outcomes. The concentration of learning experiences, student learning, and learner diversity. This endeavor is conducted to determine the impact of the Professional Salesmanship course on the business graduates of a State University in the Philippines from the school year 2018–2022. This study will focus on the impact of the course Professional Salesmanship on business graduates. This program produces well-rounded, globally competitive graduates equipped with the knowledge to excel in specific areas of business. It refers to an approach that seeks to foster all aspects of a child's progress and well-being. It emphasizes students' physical, intellectual, emotional, social, and moral growth. The key features of holistic learning include educating the whole student, viewing students as part of the whole, embracing a caring classroom culture, and engaging in experiential learning. The holistic student development in school education. It refers to an approach that seeks to foster all aspects of a child's progress and well-being. Education has evolved beyond the traditional focus on academic learning. In today's fast-paced and ever-changing world, holistic development has become a key aspect of education for lifelong learners. Holistic development encompasses the mental, emotional, physical, and social well-being of individuals, ensuring they grow into well-rounded individuals (Flowclass, 2024). It emphasizes students' physical, intellectual, emotional, social, and moral growth. The key features of holistic learning include educating the whole student, viewing the student as part of the whole, embracing a caring classroom culture, and engaging in experiential learning. The course Professional Salesmanship will put selling on a professional basis, taking into account the demands of changing times, advanced technologies, new products, and sophisticated buyers. Course topics include the selling and buying processes, creating value in buyer-seller relationships, prospecting, sales call planning, communicating the message, negotiating for win-win solutions, closing the sale, and motivating, compensating, and training salespeople (Gonzales, 2021).

The study aims to determine the impact of the course Professional Salesmanship. The business graduates' learning experiences, student learning, and diversity of learners are identified. This learner activity includes acquiring knowledge, skills, and attitudes, often moving beyond traditional instruction to include immersive, active, and digital interactions. These experiences are learner-centered, designed to be engaging, relevant, and effective for achieving specific outcomes. Student learning is often measured by educational outcomes. It is enhanced through active engagement, connecting new information to prior knowledge, and fostering positive teacher-student relationships. Effective learning involves understanding core concepts and applying them, rather than mere memorization. The diversity of learners encompasses the unique differences students bring to the classroom, including cognitive abilities, cultural backgrounds, gender, socioeconomic status, special needs, and learning styles. Embracing this diversity requires educators to use differentiated instruction, inclusive, and culturally responsive teaching strategies to ensure all students can thrive.

Literature Review

Professional Salesmanship Course

Zheng (2022) examined how social networks influence the effectiveness of salesmanship. The findings indicate that salespeople who maintain strong professional and social connections are more successful in building trust and influencing customer decisions. This

shows that professional salesmanship contributes positively to relationship building and sales effectiveness. The analysis of the relationship between salesmanship and sales performance revealed that professionalism, product knowledge, and ethical conduct of salespeople significantly improve sales outcomes. The study emphasizes that effective salesmanship has a direct impact on organizational performance (Iyadi & Isikadi, 2024). An article in the Journal of Business & Industrial Marketing investigated the impact of salesperson customer orientation on customer satisfaction and loyalty. The findings showed that salespeople who focus on understanding customer needs and offering appropriate solutions increase customer satisfaction and long-term loyalty. This highlights the importance of professional salesmanship in sustaining customer relationships (Singh & Venugopal, 2015). A study by Omar (2016) examined the moderating role of selling skills and product knowledge on customer satisfaction and organizational performance. The results revealed that professional selling skills strengthen customer trust and enhance overall business performance. This suggests that salesmanship plays a critical role in achieving positive customer and organizational outcomes. Akroush and Abu Elsamen (2012) explored the effect of professional sales practices on marketing performance. The study found that ethical selling behavior, effective communication, and customer-focused strategies significantly improve sales results. These findings confirm the positive impact of professional salesmanship on marketing success. A related discussion of the influence of professional salesmanship on customer engagement reported that customers respond more positively to salespeople who demonstrate confidence, courtesy, and competence. This indicates that professional behavior in sales enhances customer perceptions and buying intentions (Igani et al., 2024). Evanschitzky et al. (2012) examined the role of sales employees in securing customer commitment. The results showed that professional interaction, trust-building, and relationship management skills contribute to stronger customer commitment. This supports the idea that salesmanship plays an important role beyond short-term sales. Another study focused on the impact of salesmanship on customer loyalty. The findings revealed that professional selling approaches, such as personalized communication and ethical conduct, significantly increase customer loyalty. This demonstrates that effective salesmanship is essential for long-term customer retention (Ali et al., 2024). A further study analyzed the relationship between salesmanship and sales performance. The results indicated that salespeople with strong communication and negotiation skills consistently achieve higher sales targets. This confirms that professional salesmanship directly contributes to improved sales performance (Levine et al., 2024). A research report examined how professional selling skills influence customer satisfaction. The study found that knowledgeable and courteous salespeople create positive customer experiences, leading to repeat purchases and customer satisfaction. This highlights the importance of professional salesmanship in supporting business growth (Shumaker, 2023).

Learning Experiences

Using bibliometric methods, Donthu et al. (2021) analyzed the top articles, authors, and topics in the Journal of Marketing Education and grouped them into ten thematic clusters, including experiential learning and innovative teaching techniques. Bennejean and Dixon (2025) argue that sales curricula need continual refreshing to match a changing sales environment and shifting student (Gen Z) expectations. Grewal et al. (2025) propose pedagogical practices to help marketing educators prepare students for a technology-enabled era, focusing on digital tools, multiple class modalities, and an enhanced role for experiential learning. A qualitative analysis across six programme editions at the Polytechnic Institute of Viseu, Portugal (2021–2023), found that students valued active methodologies, intercultural

collaboration, and industry-aligned skill development, alongside noted implementation challenges. Scribner et al. (2025) offer insight on aligning sales curricula with the modern, technology-driven sales environment. Mainga, Murphy-Braynen, et al. (2022), in *Graduate Employability of Business Students*, conducted an exploratory descriptive study surveying final-year business students and found that graduating seniors rank communication, learning, positive attitude, and problem-solving as the most critical skills for entry-level positions. While confident in their core knowledge, students identified creativity and conflict management as areas needing further development. Mainga, Daniel, et al. (2022) found that interactive learning methods tied to engagement, critical reflection, and applied knowledge—such as case studies, group presentations, and internships—were ranked relatively low in importance by students themselves, pointing to a mismatch between preferred and effective learning methods. According to Fang et al. (2023), semi-structured interviews with business students found that face-to-face tutorials and workshops were crucial for experiential, collaborative learning that emergency remote instruction struggled to replicate. Rivera and Garden's (2021) assessment, published in Assessment & Evaluation in Higher Education, noted that while gamification is widely believed to enhance motivation and engagement in business and education settings, empirical evidence remains mixed, with some studies even reporting negative outcomes. Bai et al. (2022) conducted a two-cycle design-based study during the pandemic-driven shift to online teaching and found that adding a "fantasy" element to a gamification model improved student engagement, interaction quality, and learning performance compared to the original model.

Student Learning

Cummins et al. (2020) synthesize a decade of sales-education research and find that scholars have only begun to understand how to build effective sales-learning pedagogy. Donthu et al. (2021) conducted a bibliometric study that clusters Journal of Marketing Education research into ten themes, with experiential learning and multiple experiential techniques identified as among the most active, evolving areas of study. Bennejean and Dixon (2025) call for a continuous curriculum refresh to keep pace with how sales work—and how students learn—has changed. Grewal et al. (2025) propose updated pedagogical practices—digital tools, varied class modalities, and expanded experiential learning—to strengthen student learning in a technology-enabled marketplace. Scribner et al. (2025) examine how well current sales curricula build the competencies students need for the modern selling environment. Passarelli and Kolb (2021) explain that role-play alone does not guarantee real learning gains unless it is deliberately structured around the concrete-experience → reflection → conceptualization → active-experimentation cycle. A qualitative analysis across six programme cohorts found that students gained industry-aligned skills through active, collaborative methodologies, alongside real implementation challenges instructors had to manage (Chapman et al., 2016). Chopra (2025) applies Kolb's experiential learning theory as a foundational framework for integrating practical experiences into the curriculum, showing that immersive, real-world learning environments meaningfully bridge classroom instruction and applied skill-building. McLeod (2025) explains how the four-stage Kolb cycle (concrete experience, reflective observation, abstract conceptualization, active experimentation) is used in workplace and classroom training to convert practice into retained knowledge—a useful theoretical anchor for a conceptual framework. Siagian et al. (2024) note that persuasive-communication strategies in negotiation have evolved substantially and require adaptive, ethically grounded skill-building, and further state that sales roles offer opportunities for developing a wide range of skills, including communication, negotiation, persuasion, problem-solving, and relationship-building—a direct description of the intended learning outcomes of a

Professional Salesmanship course. The survey-based study of final-year business students identified communication skills, learning skills/agility, and positive attitude as the top employability competencies gained through coursework (Mainga, Murphy-Braynen, et al., 2022). A PRISMA systematic review of 30 studies (2017–2021) plus 188 employers found a persistent gap between what graduates have learned and what entry-level employers need, particularly in communication and customer focus (Mercado & Mercado, 2025). Mainga, Daniel, et al. (2022) found that experiential, applied learning methods (case studies, group presentations, internships) were rated less influential by students than expected, raising questions about which pedagogies actually translate into learned competencies. Cabasag (2025) cites Mainga, Murphy-Braynen, et al. (2022) in identifying communication, learning agility, positive attitude, and problem-solving as the core competencies business coursework should be producing in graduates.

Learner Diversity

Protopapa and Plangger (2023) argue, in the introduction to a dedicated special issue, that the diverse needs, wants, and preferences of audiences require fresh strategies to foster inclusive and responsible marketing practices in the classroom. A systematic review of 31 studies synthesizing strategies effective for supporting inclusion and diversity in the marketing classroom proposed a future research agenda, finding the most effective approaches involved technology use, diversity-conscious curriculum design, diversity-focused projects, and extra-curricular activities. Notably, it discusses how sales role-play performance activities have been used specifically to increase cultural intelligence among sales students (Riedel et al., 2023). Ferreira et al. (2022) propose an "Inside-Out" framework, grounded in Experiential Learning Theory, arguing that exposing students to societal diversity and inclusive practices in their marketing curricula better prepares them to connect with diverse consumers in industry. A student-co-authored study involving learners on four different management programs from six different countries examined how a real client brief centered on equality and diversity shapes learner awareness and behavior (Everett et al., 2023). Hass et al. (2023) examine how the pandemic-driven shift to online instruction disproportionately affected minority business/marketing students—a key equity dimension of learner diversity. Grier (2020) implements and assesses a course project designed to build students' awareness and understanding of diversity and inclusion in a marketing setting. Groza et al. (2024) investigate how students' differing thinking/learning styles interact with course delivery mode to affect engagement—directly relevant to how diverse learners respond to a Professional Salesmanship course delivered differently. Alonso-Martín et al. (2020) emphasize that understanding students' learning styles is important for facilitating the teaching–learning process in higher education, and find meaningful variability by gender and academic context. Lambert et al. (2024) use a case-study approach to help students apply theoretical marketing knowledge empathetically to diverse, real-world cultural contexts. Subban et al. (2025) note that acknowledging and celebrating student diversity is now integral to most universities, requiring instructional methods that accommodate this richness rather than a "one size fits all" approach. Dhakal (2024) explains differentiated instruction (DI) as a student-centered approach in which teachers tailor content, learning processes, and assessment to students' readiness, interests, and learning profiles, with evidence that DI improves motivation, engagement, and self-efficacy. Goyibova et al. (2025) frame differentiation around multiple intelligences and diverse learning profiles, offering a methodological lens applicable to how a salesmanship course might (or might not) accommodate varied learner types. DiLeo (2024) notes that differentiation is essential to accommodate diverse student backgrounds and abilities in order to achieve competency

development, even though it is more challenging to implement in larger classes—relevant to large BSBA sections taking Professional Salesmanship. Atav (2024) states that in today's diverse marketplace, embedding Diversity, Equity, and Inclusion (DEI) in marketing education is essential.

Methodology

Research Design

It is a broad plan or strategy for carrying out research to evaluate testable research questions of interest and is regarded as the framework or blueprint of the study (Kalaian, 2008). The study's design establishes the primary and secondary study types and, if necessary, the data-gathering techniques and statistical analysis strategy. The study's methodology will use quantitative descriptive design. The impact study used survey questionnaire developed by the Commissioned on Higher Education (CHED) and modified by the researcher. This study utilized convenience sampling. This is a practical and efficient method for collecting data when time, resources, or access to a population are limited.

Population and Sampling

It encompassed the one hundred (100) marketing management graduates for SY 2018–2022. The researcher used a survey questionnaire in gathering the necessary data for this study. The questionnaire adopted from the Commission on Higher Education (CHED)- a standardized tracer study questionnaire. Some parts modified as the source of information to answer the research questions. Data were gathered through availability sampling. It refers to the same method of Purposive or convenience sampling, all highlight the aspect of researcher choice or ease of access in selecting the sample, rather than relying on random chance. This is a practical and efficient method for collecting data when time, resources, or access to a population are limited. It will encompass at least seventy business graduates particularly the BSBA major in Marketing Management for year 2018–2022.

Instrument

The study's methodology used a quantitative descriptive design using graduate survey of the Commission of Higher Education (CHED).

Data Collection

In gathering data, the researchers used a Google form sent online to the identified graduates of BSBA Marketing Management, year 2018–2022. Each question was explained to ensure understanding for the attainment of accuracy and truthfulness of the response. Upon the collection of the following data and after the information was gathered, researchers include data summarization, data description, statistical description, and illustrative data. These terms all refer to the procedure in adapting statistical methods in summarizing and present the significant features of a dataset. The process of arranging and presenting data in a way that shows the frequency of occurrence of different values or categories. This term related to position, order, and relative standing within a group. It includes position, level, order, standing, classification, grading or rating.

Data Analysis

The researchers need to identify the types of data required. It should develop appropriate information collection instruments. The accumulated knowledge then needs to be stored securely, assessed, interpreted, and reported effectively. The questionnaire was composed of general information, educational background, studies attended after college such as training, data during employment period, and subjects/ syllabus suggestions to match with industry expectations. After the data has been gathered, descriptive statistics are used to analyze the frequency distribution of tables, percentiles, and rankings.

Ethical Considerations

The research procedures were followed, met, and respected by the researchers to convey the idea of making certain that something is of a certain standard or level of excellence, results can be depended upon to be consistent and accurate, both within the study itself and in future applications. It generally refers to the information obtained or determined through a research process. The participants are eager to contribute, inclined to participate, and amenable to the study. The highlights of the data were intentionally kept hidden from others. All participants received documents that permitted them or indicated that their agreement would be suitable.

The following considerations were employed in the study: Informed Consent: This will ensure that all research participants fully comprehend the study's purpose and potential applications. They will provide a clear explanation of data usage and emphasize participants' right to withdraw their consent at any time. Another is Confidentiality: This is a dedication to the preservation of confidentiality in participants' personal information and responses. Followed by Respect for Diversity: this will encompass a wide range of participants, reflecting diverse ethnicity, genders, ages, and backgrounds. Another is the Responsible Data Handling: this will consistently and securely manage research data, adhering to data protection regulations. They will take measures to anonymize and encrypt data when necessary. To consider also the Truthful Reporting: This will ensure that the reporting or research findings are accurate and honest, devoid of exaggeration or manipulation to fit preconceived expectations or interests. And lastly, Public Interest: This will prioritize the well-being of the public and society, striving to make a positive contribution to the broader discussion on beauty standards, products, and their societal impacts

Results and Discussion

This part outlines the data collected from participants using the official questionnaire or a CHED-based alumni survey. Essentially, it means utilizing the official CHED questionnaire to gather data from graduates about their educational and employment experiences. The data was examined to provide a detailed look, processed to suggest transformations, and interpreted through the implementation of frequency distribution tables below.

Table 1
Profile of the Respondents

Sex	**n**	**%**
Female	42	60
Male	28	40
Civil Status		
Single	69	98.6
Single Parent	1	1.4
Region of Origin		
Region IV-A CALABARZON/MIMAROPA)	67	95.7
Region 3 (Central Luzon)	2	2.9
Region 5 (National Capital Region)	1	1.4
Province		
Laguna	58	82.8
Cavite	4	5.7
Bulacan	2	2.9
Batangas	3	4.4
Bohol	1	1.4
Bicol	1	1.4
Quezon	1	1.4
Professional Examination Passed		
Licensure Examination for Teachers	15	22.0
Civil Service Exam – Professional	8	11.3
Civil Service Exam – Sub Professional	2	2.9
Insurance Commission Exam	1	1.5
None	44	62.3
Reason for Taking the Course		
Good grades in high school	15	22
Good grades in the course	13	18
Influence of parents or relatives	12	16
Strong passion for the profession	9	13
Peer influenced	8	11.8
Inspired by a role model	8	11.8
Prospect for immediate employment	4	5.9
Status or prestige	1	1.5
	n = 70	

Table 1 discusses the sex distribution of BSBA marketing management graduates, showing that 60.3% were female and 39.7% were male. This means that most of the SY 2018–2022 graduates are female. On the other hand, almost all graduates were single, accounting for 98.5%, while 1.5% were single parents. Meanwhile, based on the respondents' region of origin or province where they currently live, 95.4% were residing in Region IV-A in the area of CALABARZON and MIMAROPA province, 2.9% lives on Region 3 (Central Luzon), and 1.5% were residing in the National Capital Region. The majority of the respondents lives in the province of Laguna, 72.1% or 49 of them answered the stated area. Another area where the graduates were investigated was the professional examination they passed. Most of them, or 22% passed the licensure examination for teachers, followed by the civil service exam for professional level of 10.3%, next the civil service exam for sub professional level of 2.9%, and 1% answered the insurance commission exam. And finally, for the respondents' profile,

they were asked why they had taken the BSBA marketing management program, 22% or fifteen out of 68 graduates said that they have a good grades in high school, 17.6% or 12 participants mentioned that they have high grades in the course, 16% or 11 of them were influence of parents or relatives, 13% or 9 of them responded that the strong passion for the profession, 11.8% or 8 of them answered peer Influenced and inspired by a role model, 5.9% or 4 of them answered prospect for immediate employment and lastly, only 1 graduate or 1.5% answered because of status or prestige.

Table 2
Employment Data

Employment Status	**n**	**%**
Employed	66	94.3
Unemployed	4	5.7
Reasons of Unemployed Graduates		
Family concern and decided no	2	66.7
Health-related reason (s)	2	66.7
No job opportunity	1	33.3
Business venture	1	33.3
Present Employment Status		
Regular or Permanent	55	78.6
Temporary	2	2.9
Casual	2	2.9
Contractual	4	5.9
Self-employed	9	11.8
Line of Business of the Company		
Financial intermediation	14	20
Real Estate, Renting and Business Activities	10	14.4
Wholesale and Retail trade, Repair of Motor Vehicle	7	10
Manufacturing	6	8.7
Education	4	5.7
Health & Social Work	5	7.1
Other Community, Social & Personal Services Activities	5	7.1
Extra-territorial Organizations and Bodies	3	4.3
Agriculture, Hunting and Forestry	1	1.4
Electricity, Gas and Water Supply	1	1.4
Construction	5	7.1
Hotels and Restaurants	5	7.1
Transport Storage and Communication	4	5.7
Place of Work		
Local	62	88.6
Abroad	8	11.4
First Job After College		
No	42	60
Yes	28	40
Reasons for Staying on the Job		
Salaries and benefits	20	74.1
Career challenge	17	63
Related to special skills	12	44.4

Related to course or program	13	48.1
Proximity to residence	10	37
Peer influence	1	3.7
Family influence	3	11.1
First Job is Related to the Course Taken		
Yes	23	32.8
No	4	5.8
No response	43	61.4
Competencies Learned in College that is Useful in First Job		
Communication skills	26	86.7
Human Relations skills	15	50
Problem Solving skills	20	66.7
Critical Thinking skills	20	66.7
Sellings skills	16	53.3
Entrepreneurial skills	13	43.3
Information Technology skills	5	16.7
Business administration skills & basic marketing skills	1	3.3
	n = 70	

Table 2 presented the employment data of all the graduates. The parameters identified here are based on the CHED standardized tracer study questionnaire form. The current employment status of graduates says that 24 out of 28 are employed, with which 70.8% of them being regular or permanent employees in their respective companies. Four respondents said they are casual, while the remaining three employed graduates are contractual or self-employed.

Based on the survey, the impact of the course on the learning experiences of business graduates highlights business graduates' employability and competence. Some of the core learning outcomes and real-world impact provide skill acquisition and development through

1. Role playing that engage in recorded role-plays and real-world sales pitches that helps students to translate theoretical frameworks into practical actions.
2. Increased confidence in problem-solving, reading consumer behavior, active listening, and handling objections.
3. Their active learning shift will move away from passive lectures, and active learning strategies heavily foster behavioral skill development.

Based on the survey, the impact of the course on the student learning of graduates is employed, business graduates who participate in sales simulations is significant.

1. They are less “entry shock” upon entering the workforce, which leads to higher confidence in their individual critical thinking and negotiation skills.
2. The course transforms classroom concepts into revenue-generating skills that are highly attractive to local and global employers. For business graduates eyeing an entrepreneurial mindset or freelance ventures.
3. The course directly cultivates confidence, resilience, and the ability to persuade stakeholders. They learn how to create market demand, manage objections, and secure long-term client loyalty.

Based on the survey, the course impacts learner diversity in pedagogy, such as leveling the playing fields, which translates diverse life experiences into professional skills. This will allow students from varied backgrounds.

1. To master universal competencies like empathy, negotiation, and rapport-building.
2. It also reduces demographic disparities in the formal sales training that diminish baseline gender and cultural differences in career perceptions. It encourages a shared, realistic expectation of client-oriented service.
3. Lastly, it accommodates different learning styles, such as role playing and client interactions, that cater to diverse learners, improving knowledge retention compared to purely theoretical lectures.

Conclusion

The recommendation will help to alleviate the holistic student development program based on Pillar 1 SG3. The assessment of the topics included in the course Professional Salesmanship aligned with industry expectations will determine the most needed one.

1. Most SY 2018–2022 graduates are female and single; the majority reside in Region IV-A (Laguna). Academic achievement and parental influence were primary motivators for choosing the program.
2. The majority of graduates are employed in regular/permanent positions. Key reasons for staying in their jobs include salaries & benefits, career challenges, and skills relevance. Core competencies gained—communication, selling, critical thinking, problem-solving, and human relations—proved most useful in their careers.
3. The institutions around the City of Santa Rosa, Laguna, integrating professional selling is highly relevant due to the presence of large economic zones, BPOs, and multinational companies operating in the region.
4. The local business administration programs adapted applied learning frameworks to ensure students understanding on how to pitch, close deals, and secure commitments in competitive environments.

Recommendation

Based on the conclusions of this study, the following recommendations are offered.

1. Since the majority of graduates were female, single, and predominantly residing in Region IV-A (Laguna), and that academic achievement and parental influence served as primary motivators for program enrollment, it is recommended by the researchers that the institution strengthen its career guidance and orientation programs by actively involving parents of the students in academic planning activities and by highlighting the institution's academic strengths to prospective students within the local community.
2. The most graduates were found to be employed in regular or permanent positions and reported that salaries and benefits, career challenges, and skills relevance were the primary reasons for job retention, it is recommended that the Business Administration program continue to innovate the teaching of core competencies—particularly communication, selling, critical thinking, problem-solving, and human relations—through updated instructional strategies, industry immersion programs, and curricular enhancements that align with current industry demands.
3. With the consideration of the professional selling within the local economic context, particularly the presence of economic zones, business process outsourcing (BPO) firms, and multinational companies in and around the City of Santa Rosa, Laguna, it

is recommended that higher education institutions in the area formally integrate professional selling as a core component of the Business Administration curriculum, supported by partnerships with local industries for practicum placements and guest lectures from sales and business development practitioners.

4. In relation to the finding that existing programs apply structured learning frameworks to develop students' pitching, negotiation, and deal-closing skills, it is recommended that institutions further develop experiential and simulation-based learning strategies, such as mock sales presentations, negotiation workshops, and exposure to customer relationship management (CRM) tools, to strengthen and empower students' readiness for competitive, sales-driven work environments.
5. It is further recommended that future researchers conduct/ continue periodic tracer studies to continuously assess graduate employability outcomes and curriculum effectiveness, thereby ensuring that academic programs remain actively responsive to the evolving demands of local and regional industries.

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

The author declares that Grammarly, an AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from Grammarly, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Akroush, M., & Abu Elsamen, A. (2012). An empirical investigation of the mediating role of relationship marketing skills on the relationship between customer satisfaction and customer loyalty. *International Journal of Internet Marketing and Advertising, 7*(1), 1–30. https://doi.org/10.1504/IJIMA.2012.04495

Ali, M., Amir, H., & Ahmed, M. (2024). The role of university switching costs, perceived service quality, perceived university image and student satisfaction in shaping student loyalty. *Journal of Marketing for Higher Education, 34*(1), 201–222.

Alonso-Martín, P., Cruz-Díaz, R., Granado-Alcón, C., Lago-Urbano, R., & Martínez-García, C. (2020). Variability of Higher Education Students' Learning Styles Depending on Gender, Course, Degree and Institutional Context. *Sustainability*, *13*(4), 1659. https://doi.org/10.3390/su13041659

Atav, G. (2024). Incorporating Diversity Equity and Inclusion (DEI) Topics into Introductory Marketing Courses. *Journal for Advancement of Marketing Education, 32*(1). https://doi.org/10.63963/001c.150617

Bai, S., Hew, K. F., Gonda, D. E., Huang, B., & Liang, X. (2022). Incorporating fantasy into gamification promotes student learning and quality of online interaction. *International Journal of Educational Technology in Higher Education, 19*, Article 29. https://doi.org/10.1186/s41239-022-00335-9

Bennejean, C. L., & Dixon, A. L. (2025). Rethinking sales education: Aligning curriculum with the evolving sales landscape and student expectations. *Journal of Marketing Education, 47*(3), 252–257. https://doi.org/10.1177/02734753251362880

Cabasag, R. (2025). Assessing the Adequacy of Marketing Skills Development Among BSBA Graduating Students: A Case Study. *United International Journal for Research & Technology, 6*(5), 160–170.

Chapman, Schetzsle, & Wahlers (2016). An Innovative, Experiential-Learning Project for Sales Management and Professional Selling Students. *Marketing Education Review, 26*(1), 45–50. https://doi.org/10.1080/10528008.2015.1091674

Chopra, K. (2025). Beyond the classroom: A retail store based experiential learning approach to business education. *The International Journal of Management Education, 23*(3), 101236. https://doi.org/10.1016/j.ijme.2025.101236

Cummins, Nielson, Peltier, & Deeter-Schmelz (2020). *A Critical Review of the Literature for Sales Educators 2.0. Journal of Marketing Education, 42*(3), 198–216.

Dhakal, B. R. (2024). Differentiated Instruction: Tailoring Learning for Diverse Learners. Curriculum Development Center.

DiLeo, R. (2024). Comparative analysis of differentiation among students in higher education versus elementary education. *International Journal on Social and Education Sciences (IJonSES), 6*(2), 264–274. https://doi.org/10.46328/ijonses.662

Donthu, Kumar, Mills, & Pattnaik (2021). *Journal of Marketing Education: A Retrospective Overview Between 1979 and 2019.*

Evanschitzky, H., Sharma, A., & Prykop, C. (2012). The role of the sales employee in securing customer satisfaction. *European Journal of Marketing, 46*(3–4), 489–508. https://doi.org/10.1108/03090561211202576

Everett, S., Gunduc, M., Junjunia, M., Kroener, L., Maise, J., Scott-Hyde, K., Salem, L., & Simsek, A. (2023). Transformational Learning: Using Equality and Diversity Marketing Client Briefs to Foster Awareness, Application and Action. *Marketing Education Review, 33(*1), 56–75. https://doi.org/10.1080/10528008.2022.2129264

Fang J, Pechenkina E, Rayner GM. Undergraduate business students' learning experiences during the COVID-19 pandemic: Insights for remediation of future disruption. *The International Journal of Management Education, 21*(1), 100763. https://doi.org/10.1016/j.ijme.2023.100763

Ferreira, C., Robertson, J., Reyneke, M. & Pitt, L. (2022). Inside-Out: Using the Marketing Classroom to Mirror Diversity and Inclusion of the Marketplace. *Marketing Education Review, 33*(1), 7–21. https://doi.org/10.1080/10528008.2022.2139624

Goyibova, N., Muslimov, N., Sabirova, G., Kadirova, N., & Samatova, B. (2025). Differentiation approach in education: Tailoring instruction for diverse learner needs. *MethodsX, 14*, 103163. https://doi.org/10.1016/j.mex.2025.103163

Grewal, D., Guha, A., Beccacece Satornino, C., & Becker, M. (2025). The Future of Marketing and Marketing Education. *Journal of Marketing Education*, *47*(1), 61–77. https://doi.org/10.1177/02734753241269838

Grier, S. A. (2020). Marketing Inclusion: A Social Justice Project for Diversity Education. *Journal of Marketing Education, 42*(1). https://doi.org/10.1177/0273475319878829

Groza, M. D., Groza, M. P., & Hasbrouck, S. (2024). Student Thinking Styles and Course Engagement in Online Versus Face-to-Face Marketing Courses. *Journal of Marketing Education, 46*(3). https://doi.org/10.1177/02734753241259488

Hass, D., Hass, A., & Joseph, M. (2023). Emergency online learning & the digital divide: An exploratory study of the effects of COVID-19 on minority students. *Marketing Education Review, 33*(1), 22–37. https://doi.org/10.1080/10528008.2022.2136498

Igani, C., Ohalete, S. C., & Ohalete, E. A. U. (2024). Personal selling skills and business performance of boutique owners in Port Harcourt. *BW Academic Journal, 1*(3), 1–18.

Iyadi, R. C., & Isikadi, S. (2024). Salesmanship and sales performance of selected organizations. *World Journal of Entrepreneurial Development Studies, 9*(7), 1–20.

Lambert, C., Fong-Emmerson, M., & Coetzee, S. (2024). Enhancing Marketing Students' Indigenous Cultural Competencies Through a Decolonisation and Authentic Assessment Approach. *Australasian Marketing Journal, 32*(3). https://doi.org/10.1177/14413582241244568

Levine, L. R., Heinze, T. C., & Puckett, A. (2024). Nonverbal communication and sales performance: Do high- and low-performing sales students gesture in the same way? *Marketing Education Review, 34*(1), 31–43.

Mainga, W., Daniel, R. M., & Alamil, L. (2022). Perceptions of employability skills of undergraduate business students in a developing country: An exploratory study. *Higher Learning Research Communications, 12*(1), 28–63. https://doi.org/10.5590/hlrc.2022.v12i1.1257

Mainga, W., Murphy-Braynen, M. B., Moxey, R., & Quddus, S. A. (2022). Graduate Employability of Business Students. *Administrative Sciences*, *12*(3), 72. https://doi.org/10.3390/admsci12030072

McLeod, S. (2025). Kolb's Learning Cycle. Simply Psychology.

Mercado, J. & Mercado, R. (2025). Gap Analysis of Unemployed Business Graduates' Employability Skills and Industry Preferences. https://doi.org/10.13140/RG.2.2.31438.16965

Omar, K. (2016). The moderating roles of selling skills and knowledge on the customer satisfaction and the organization performance. *American Journal of Economics, 6*(3), 47–54. https://doi.org/10.5923/j.economics.20160603.02

Rivera, E. S., & Garden, C. L. P. (2021). Gamification for student engagement: a framework. *Journal of Further and Higher Education*, *45*(7), 999–1012. https://doi.org/10.1080/0309877X.2021.1875201

Scribner, Delpechitre, & Lastner (2025). Does Your Sales Curriculum Need a Refresh? *Journal of Marketing Education* (advance online publication).

Shumaker, L. M. (2023). *Improving retention in the customer service department through increased learning and professional development and job satisfaction* [Doctoral dissertation, Marymount University]. ProQuest LLC.

Siagian, E. I., Nurkarim, M. C., & Maharani, N. (2024). Persuasive Communication in Business Negotiations: Strategies and Techniques. *Ilomata International Journal of Social Science*, *5*(2), 428–443. https://doi.org/10.61194/ijss.v5i2.1165

Singh, R., & Venugopal, P. (2015). The impact of salesperson customer orientation on sales performance via mediating mechanism. *Journal of Business & Industrial Marketing, 30*(5), 594–607.

Subban, P., Suprayogi, M. N., Preston, M., Liyani, A. N., & Ratri, A. P. P. (2025). "Differentiation is sometimes a hit and miss." Educator perceptions of differentiated instruction in the higher education sector. *The Asia-Pacific Education Researcher, 34*(3), 873–884. https://doi.org/10.1007/s40299-024-00904-8

Zheng, X. (2022). Salesmanship: The influence of social networks on sales-service ambidexterity. *Management Decision, 60*(11), 3086–3126. https://www.wku.edu/jos/documents/issues/v24n1/jos-2024-1_article6.pdf

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Leveraging GPTutor in a Flipped Learning Activity to Improve Student Engagement

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Abstract

Student engagement with lecture content can be significantly enhanced through effective pre-class preparation. Traditionally, students often lack motivation to read assigned materials before attending class, which can hinder meaningful participation in discussions. To address this challenge, a flipped learning activity leveraging GPTutor, a generative AI chatbot, was introduced at a business school in Hong Kong. This innovative approach enables students to interact with the chatbot anytime and anywhere, allowing them to clarify concepts prior to class, thereby fostering a more active learning environment. A pilot test of this approach was conducted during the 2024–2025 academic year. Students were instructed to use GPTutor to review lecture topics and complete multiple-choice questions before class. The goal was to help students develop a foundational understanding of the content, enabling class time could be devoted to more interactive and meaningful discussions. Data were collected in December 2024 to assess students' perceived motivation towards using GPTutor, their enjoyment of the activity, and overall satisfaction with the flipped classroom model. Regression analysis was conducted to examine the relationships among these variables. Results showed that motivation to use GPTutor significant predicted enjoyment of the flipped learning activity, which contributed to high overall satisfaction. Findings from this pilot study indicate that GPTutor can serve as an effective learning platform for implementing innovative pre-class and post-class activities, enhancing student learning experiences and complementing the traditional lecture mode. This approach may offer potential benefits for wider adoption in future educational settings.

Keywords: flipped learning, GPTutor, higher education, student engagement

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Introduction

In higher education, instructors typically provide reading materials and encourage students to review them before class to ensure they gain a foundational understanding of the lecture content. This preparation allows students to engage more effectively in class discussions, particularly in universities that adopt a flipped classroom model. However, it is widely recognized that many students do not study the materials in advance, which can hinder the learning climate developed for an interactive classroom.

To address this challenge, a university in Hong Kong has adopted a Generative AI-powered platform, GPTutor, to serve as a supportive learning partner for students. A primary feature is the document chatbot, which allows students to ask questions about course materials uploaded by their instructors. The AI then answers these questions based on the relevant information found within the uploaded contents. Students can further explore the content using conversational prompts. This innovative approach enables students to interact with the chatbot anytime and anywhere, allowing them to clarify concepts prior to class, thereby fostering a more active learning environment both beyond and within the class time (Ko, 2025).

Prior to the full-scale implementation of the flipped learning model and the integration of GPTutor as a pedagogical tool, this pilot study examines student motivation, perceived enjoyment, and overall satisfaction with the flipped learning activities. The findings provide insights into enhancing student engagement with lecture content. By leveraging these results, instructors can design more effective and meaningful flipped learning interventions that foster proactive pre-class preparation. If the pilot proves successful, the model will be scaled across various subjects to evaluate its long-term institutional viability.

Literature Review

Flipped Learning

The flipped classroom has been widely adopted as an educational approach where reverses traditional instructional methods. In a traditional, didactic classroom, students passively listen to lectures was often deemed ineffective for long-term knowledge retention. In contrast, the flipped approach allows students to acquire foundational concepts independently before class, such as reading case studies, watching videos, or interacting with an AI tool like GPTutor. Class time is then dedicated to active learning activities such as discussions, problem-solving, and debates, with the instructor serving as a facilitator. While flipped learning may not be embraced by all students, it offers advantages for self-paced learning. For example, slower-paced learners can pause, rewind, or ask AI chatbot the same question multiple times without feeling embarrassed. By ensuring students know the basics before class starts, instructors can avoid basic lectures and focus instead on deeper, interactive learning.

GPTutor

In the realm of educational technology, instructors can leverage various tools to design pedagogical models that support flipped learning. At a university in Hong Kong, GPTutor, a Generative AI-powered learning platform, is utilized to enhance the student experience through self-directed learning (Bai et al., 2025; GPTutor, 2026; Lui et al., 2024). The platform offers features such as AI-generated summaries and automated responses based on lecture materials uploaded by instructors. By enabling students to initiate conversations, GPTutor encourages

them to actively explore course content and engage in deeper thematic inquiry. Additionally, the platform provides review questions to assess student knowledge and identify areas for improvement, while generating learning analytics to help instructors track progress. To examine how AI chatbots can enhance student learning and motivate them in self-directed, active learning, this pilot study adopted the chatbot feature of GPTutor.

Methodology

This study employed a quantitative research design to evaluate student engagement within a flipped classroom model. Data collection took place during the 2024–2025 academic year at a business school in the Hong Kong Special Administrative Region. The study targeted a sample of 146 students, comprising both undergraduate and postgraduate cohorts.

The instructional design required students to participate in a pre-class flipped learning activity utilizing GPTutor as their learning partner. Students were provided a two-week window prior to the in-class session to review assigned lecture topics at their own pace and complete a multiple-choice assessment. The primary objective of this intervention was to establish a foundational understanding of the course material, targeting lower-order cognitive skills. By mastering these fundamentals independently, students could then engage in a more interactive and high-order in-class discussions. Following the completion of the AI-supported pre-class tasks and the subsequent flipped classroom session, participants were invited to complete a survey.

Measurement Items

The survey instrument was designed to assess three key dimensions: students' perceived motivation toward using GPTutor, their level of perceived enjoyment during the activity, and their overall satisfaction with the flipped classroom activities. All items were measured in a five-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

Perceived Motivation was assessed using a three-item scale adapted from Intrinsic Motivation Inventory (Bosch, 2024). The items included "I felt motivated to learn about GPTutor", "I felt motivated by the incentives to use GPTutor in this flipped learning activity", and "I felt motivated to learn new technologies such as GPTutor".

Perceived Enjoyment during the flipped learning activity was adapted from the "Positive Enjoyment Scale" (Fuentesal-Garcia et al., 2019). Three relevant items were included, namely "The activity was pleasurable to me", "Replacing lecture by this activity was fun", and "The activity made me feel good".

Overall Satisfaction with the flipped learning activity was measured by three statements namely "In general, replacing the lecture by this flipped learning activity is good", "In general, using flipped learning activity during mid-term period is good", and "In general, I am satisfied with this flipped learning activity".

Results

101 valid responses (68%) were obtained and used for subsequent analysis. Statistical analysis was performed using SPSS version 29.0. The reliability of the measurement instrument was first confirmed through Cronbach's alpha. Cronbach's alpha is a coefficient of internal

consistency that indicates how closely related a set of items are as a group; values range from 0 to 1, with higher values reflecting greater reliability of the scale. Subsequently, regression analysis was utilized to determine the predictive power of the independent variables.

Internal Consistency Analysis

As shown in Table 1, the internal consistency analysis revealed that all measurement scales exhibited acceptable to good reliability, with Cronbach's alpha coefficients exceeding the recommended thresholds of 0.70. Specifically, "Overall Satisfaction with Flipped Learning" yielded a high Cronbach's alpha value ($\alpha = .842$), suggesting that the items consistently capture the intended latent construct. "Perceived Motivation towards GPTutor" and "Perceived Enjoyment" also exhibited robust reliability ($\alpha = .804$ and .785, respectively), thereby validating their use in subsequent statistical analyses.

Table 1
Internal Consistency

Construct	Cronbach's α
Perceived Motivation towards using GPTutor	0.804
Perceived Enjoyment	0.785
Overall Satisfaction with Flipped Learning	0.842

Flipped Learning Activity

A series of linear regression analyses was conducted to evaluate the proposed flipped learning model using post-lesson data. First, perceived motivation toward GPTutor (Table 2) was found to be a significant predictor of perceived enjoyment during the flipped learning activity, $R^2 = .459$, $F(1, 99) = 83.98$, $p < .001$. The regression coefficient was positive and substantial ($B = 0.710$, $\beta = 0.677$, $p < .001$), indicating that students with higher motivation to use GPTutor reported greater enjoyment of the GPTutor platform.

Table 2
Regression Analysis Predicting Perceived Enjoyment

Predictor	B	SE	β	t	p
Perceived Motivation (GPTutor)	0.710	0.077	0.677	9.16	.000

Note. Model fit: $R = .677$, $R^2 = .459$, Adjusted $R^2 = .454$, $F(1, 99) = 83.98$, $p < .001$.

As presented in Table 3 below, enjoyment of the activity strongly predicted overall satisfaction with the flipped learning arrangement, $R^2 = .407$, $F(1, 99) = 68.00$, $p < .001$. Perceived enjoyment exerted a significant positive effect ($B = 0.715$, $\beta = 0.638$, $p < .001$), suggesting that the affective experience during the activity is a key determinant of students' satisfaction with the flipped approach overall.

Table 3
Regression Predicting Overall Satisfaction With Flipped Learning

Predictor	B	SE	β	t	p
Perceived Enjoyment	0.715	0.087	0.638	8.25	.000

Note. Model fit: $R = .638$, $R^2 = .407$, Adjusted $R^2 = .401$, $F(1, 99) = 68.00$, $p < .001$.

Discussion

The regression analysis examined the relationships among the three variables. The findings revealed that student motivation toward GPTutor was a significant predictor of perceived enjoyment, which subsequently contributed to high overall satisfaction with the flipped learning activity.

Based on the findings, to enhance overall student satisfaction within the flipped learning framework is essential. Drawing on the Adult Learning Theory, learners must understand the "why" behind a new task. In this study context, the rationale for using GPTutor should be well-explained. Organizing a structured pre-task orientation to showcase the tool's functionality and its value to their learning outcomes can bridge the expectation gap. Furthermore, extrinsic motivators, such as bonus marks, for the successful completion of the multiple-choice questions, may further encourage their participation and engagement level.

Lastly, instructors should leverage the usage analytics in the GPTutor platform and the results from pre-class multiple-choice questions to pivot their in-class instruction. By identifying common misconceptions before the session begins, instructors can address specific knowledge gaps in a timely manner. This shift fosters greater student engagement and optimizes classroom time for higher-order learning activities.

Conclusion

Findings from this pilot study indicate that GPTutor's chatbot feature can serve as an effective platform for pre-class flipped learning. Specifically, the chatbot provides a low-stakes environment where hesitant or shy students can ask questions without the fear of embarrassment. By complementing traditional lectures, this approach not only enhances the student learning experience but also fosters self-directed learning motivation. Consequently, these results offer promising implications for wider adoption in future educational settings. Furthermore, in the emerging era of AI in education, GPTutor's other features, such as flashcards, review questions, and role-play simulations, warrant further exploration across various disciplines as viable learning tools for adaptive, self-paced learning.

Limitations and Future Research

This study has several limitations that should be acknowledged. First, the sample size was relatively small and limited to a single business school in Hong Kong. Second, due to the pilot and cross-sectional nature, data were collected at a single point in time, suggesting instructors should exercise caution in interpreting the findings. To build upon these findings, future studies should validate these results using larger and more diverse samples across different faculties and partnering universities.

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

The author declares that GenAI (via PolyU), an AI-assisted writing software was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that no other AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Bai, H., Lui, W. C., & Khiatani, P. V. (2025). Promoting student engagement with GPTutor: An intelligent tutoring system powered by generative AI. *International Journal of Educational Technology in Higher Education*, *22*(1), 77.

Bosch, C. (2024). Assessing the Psychometric Properties of the Intrinsic Motivation Inventory in Blended Learning Environments. *Journal of Education and e-Learning Research*, *11*(2), 263–271.

Fuentesal-García, J., Baena-Extremera, A., & Sáez-Padilla, J. (2019). Psychometric characteristics of the physical activity enjoyment scale in the context of physical activity in nature. *International Journal of Environmental Research and Public Health*, *16*(24), 4880.

GPTutor. (2026). *Revolutionize Learning with GPTutor for modern education*. The Hong Kong Polytechnic University. https://gptutor.comp.polyu.edu.hk/

Ko, A. (2025). A customer-designed GPTutor learning space to enhance self-learning motivation: A study of undergraduate students' attitudes and readiness. In *2025 INTED2025 Proceedings* (pp. 5684–5687). IATED.

Lui, R. W. C., Bai, H., Zhang, A. W. Y., & Chu, E. T. H. (2024, AUGUST). GPTutor: A generative AI-powered intelligent tutoring system to support interactive learning with knowledge-grounded question answering. In *2024 international conference on advances in electrical engineering and computer applications (AEECA)* (pp. 702–707). IEEE.

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Learning Phronesis for Global Citizenship: Classical Narratives and Moral Decision-Making in Secondary Education

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Abstract

This paper presents a guidance-oriented educational workshop designed for upper secondary education, structured as a narrative workshop where classical texts, autobiographical writing, and philosophical dialogue function as devices for ethical reflection and global citizenship education. Grounded in guidance pedagogy, constructivism, and narrative approaches to identity formation, the project conceptualises orientation not as an ancillary activity but as a structural dimension of learning. Drawing on Aristotle's notion of phronesis (practical wisdom), the workshop explores how students can learn to connect ethical principles with concrete situations, exercising responsible judgment in contexts of moral complexity and cultural pluralism. Classical Greek and Latin texts are approached as generative narratives that raise existential questions about responsibility, choice, and the good life. In dialogue with contemporary thinkers such as Hans Jonas, Martha Nussbaum, and Amartya Sen, phronesis is reframed as a key educational competence for navigating uncertainty, fostering ethical agency, and cultivating global citizenship.

Keywords: orientative phronesis, practical wisdom, global citizenship education, humanities education, educational orientation

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Introduction

The educational challenges of the twenty-first century extend far beyond the transmission of disciplinary knowledge or the preparation of students for future employment. Rapid technological innovation, ecological transitions, democratic instability, cultural pluralism, global interdependence, and the growing influence of artificial intelligence have profoundly transformed the conditions under which individuals construct meaning, make decisions, and participate in social life. Within this increasingly complex scenario, schools are called upon not only to promote cognitive achievement but also to cultivate learners capable of exercising critical judgement, assuming ethical responsibility, and orienting themselves in contexts characterised by uncertainty and continuous change.

This educational challenge has progressively reshaped international conceptions of Global Citizenship Education (GCED). Rather than limiting citizenship to civic knowledge or intercultural awareness, contemporary international frameworks emphasise the development of learners who can interpret complexity, deliberate responsibly, and contribute to democratic and sustainable futures. UNESCO's Global Citizenship Education agenda, the Futures of Education initiative, and the OECD Learning Compass 2030 converge in recognising that responsible participation in contemporary societies requires educational processes capable of integrating knowledge, values, reflection, and action. These perspectives suggest that education should prepare individuals to understand the world and also to exercise responsible judgement within it.

Although recent educational research has significantly advanced the fields of Global Citizenship Education, narrative pedagogy, Life Design (Savickas et al., 2009) and educational orientation, comparatively limited attention has been devoted to how disciplinary learning in the humanities may intentionally cultivate practical wisdom as an educational competence. Existing studies have extensively explored identity construction, career adaptability, learner agency, and reflective learning, yet the educational processes through which students develop the capacity to deliberate ethically in situations characterised by ambiguity, conflicting values, and uncertainty remain comparatively underexplored.

Within this perspective, educational orientation can no longer be understood exclusively as vocational guidance or as support for educational transitions. Contemporary orientation pedagogy increasingly interprets orientation as a lifelong educational process through which individuals construct meaning, develop agency, interpret experience, and progressively shape coherent life trajectories. Orientation therefore becomes an intrinsic pedagogical dimension of teaching itself rather than an additional educational service delivered at specific moments of schooling. Such an understanding substantially broadens the educational mission of schools, positioning every curricular experience as a potential opportunity for learners to develop the interpretative and ethical capacities required for responsible participation in personal, professional, and civic life.

Narrative approaches have contributed decisively to this transformation by reconceptualising identity as a dynamic process of meaning-making. Through narrative interpretation, individuals organise experience, connect past and present, and imagine possible futures, continuously reconstructing their understanding of themselves in relation to changing social contexts. Consequently, educational experiences acquire orientation value insofar as they enable learners to interpret their own biographies, recognise personal values, and develop coherent projects for the future.

Within this broader educational framework, the humanities—and classical literature in particular—occupy a distinctive pedagogical position. Greek and Latin narratives confront students with enduring questions concerning justice, responsibility, freedom, courage, loyalty, power, vulnerability, and the search for the good life. These texts invite readers to engage with ethically complex situations whose interpretative openness continues to resonate across historical and cultural contexts. Their educational significance therefore lies in providing opportunities for reflective interpretation, ethical deliberation, and personal meaning-making. It is precisely this educational potential that makes classical humanities particularly relevant for contemporary orientation pedagogy and GCED (Nussbaum, 1997, 2010).

To address this theoretical and pedagogical challenge, the present article proposes Orientative Phronesis, a novel educational construct, as paideia (Bruni, 2021) that conceptualises practical wisdom as a competence intentionally cultivated through humanities education. Building upon Aristotelian virtue ethics (Aristotle, 2004) hermeneutic philosophy (Gadamer, 2004) narrative identity theory (Ricoeur, 1992) orientation pedagogy (Bertagna, 2023) and GCED (UNESCO, 2015). *Orientative Phronesis* is understood as the educational capacity through which learners interpret complex situations, deliberate ethically, construct meaningful narratives of the self, and orient their personal and civic trajectories responsibly and cultivate *humanitas*, tolerance and open-mindedness.

To operationalise this construct, the study introduces the Narrative Orientation Laboratory (NOL), an interdisciplinary pedagogical model that integrates hermeneutic interpretation of classical narratives, autobiographical writing, and philosophical dialogue within ordinary humanities teaching.

The laboratory is conceived a pedagogical environment in which literary interpretation becomes an opportunity for ethical inquiry, reflective self-understanding, and responsible educational orientation.

By connecting disciplinary learning with existential questioning and democratic deliberation, the model seeks to demonstrate how classical humanities may contribute directly to the educational aims of GCED.

Research Design

This study adopts a conceptual design study informed by the principles of Design-Based Research (DBR) with the aim of developing a theoretically coherent pedagogical framework capable of intentionally fostering practical wisdom through humanities education. Rather than evaluating the effectiveness of a specific educational intervention, conceptual design studies seek to generate innovative pedagogical models by integrating existing theoretical knowledge into coherent frameworks that can subsequently guide empirical investigation. Within this perspective, the present article represents the initial stage of a broader research programme whose subsequent phases will involve classroom implementation, iterative refinement, and empirical validation.

Design-Based Research provides an appropriate methodological orientation because it conceives educational innovation as an iterative process linking theoretical reflection, pedagogical design, implementation, evaluation, and progressive refinement. Although the present contribution does not yet report findings from classroom experimentation, it adopts the

underlying logic of DBR by moving systematically from educational theory towards the design of a pedagogical model intended for authentic educational contexts.

The methodological objective is the construction of an educational framework capable of explaining how practical wisdom may be intentionally cultivated through disciplinary learning in the humanities. More specifically, the study seeks to identify the theoretical principles, educational processes, and pedagogical conditions through which literary interpretation, autobiographical reflection, and philosophical dialogue may contribute to the development of ethical judgement, agency, and educational orientation within secondary education.

This methodological proposal reflects an increasingly recognised assumption within educational research: innovative pedagogical practices require rigorous conceptual development before they can be meaningfully implemented and evaluated. From this standpoint, conceptual model building constitutes an essential phase of educational inquiry, providing the theoretical architecture upon which future intervention studies may be constructed.

Educational Orientation Beyond Career Guidance

Educational orientation has undergone a profound theoretical transformation over the past three decades. Once primarily associated with vocational guidance and support for educational transitions, it is now increasingly understood as a lifelong pedagogical process through which individuals construct meaning, develop agency, and progressively shape their own biographies within complex and rapidly changing societies. This shift reflects a broader understanding of education itself, in which learning is expected not only to prepare students for future occupations but also to enable them to interpret uncertainty, exercise responsible judgement (Jonas, 1984) and participate actively in democratic life to shaping sustainable futures.

The transition from traditional guidance models to constructivist and narrative perspectives has been central to this evolution. Career Construction Theory and the Life Design paradigm (Savicksas et al., 2015) reposition educational orientation from the search for occupational correspondence towards the continuous construction of personal identity. Adaptability, reflexivity, and autobiographical meaning-making consequently become educational resources through which individuals respond creatively to social transformation rather than merely adapting to predetermined career pathways. Similarly, theory of self-construction (Guichard, 2005) emphasises that identity develops through an ongoing process of interpretation in which educational, personal, and professional experiences are continuously reorganised into coherent narratives. Orientation thus becomes less concerned with choosing among available opportunities than with cultivating the capacity to interpret one's own experience responsibly over time.

Within Italian educational research, this perspective has been further developed through the concept of *didattica orientativa*, which conceives orientation as an intrinsic dimension of teaching rather than a specialised educational service. From this standpoint, every curricular activity potentially contributes to learners' personal development by promoting self-awareness, reflective competence, decision-making, and agency alongside disciplinary learning. Teaching therefore acquires an explicitly Orientative function, enabling students to recognise personal resources, confront uncertainty, and progressively assume responsibility for their educational and life trajectories.

International educational agendas reinforce this broader conception. UNESCO's Global Citizenship Education framework and Reimagining Our Futures Together, together with the OECD Learning Compass 2030, consistently identify learner agency, democratic participation, anticipation, reflection, and responsible action as fundamental educational outcomes. These frameworks converge in recognising that contemporary schools are expected to cultivate the capacities required to navigate complexity within pluralistic and interconnected societies. Educational orientation consequently assumes a central role in enabling learners to connect disciplinary understanding with ethical responsibility and civic participation in a world of liquid complexity and continuous transformation (Morin, 2000; Bauman, 2000, 2004, 2007).

Despite these significant theoretical developments, an important educational question remains insufficiently addressed. While learner agency is widely recognised as an essential educational objective, less attention has been devoted to the pedagogical processes through which students learn to deliberate wisely, when confronted with ethically ambiguous situations characterised by conflicting values, and multiple legitimate alternatives. This unresolved question becomes particularly significant within Global Citizenship Education, where responsible participation depends not only upon identity construction but also upon the capacity for contextual ethical judgement. It is precisely at this intersection that the present study locates its theoretical contribution.

The conceptual framework developed in this study emerges from the convergence of five complementary theoretical traditions that, although frequently investigated independently, have rarely been integrated into a coherent educational model. These perspectives collectively illuminate the educational conditions through which learners may develop the capacity to interpret experience, deliberate responsibly, and orient their life trajectories within increasingly complex social contexts. Their integration provides the theoretical foundation for the construct of *Orientative Phronesis.*

The first tradition derives from Aristotelian virtue ethics, particularly the concept of phronesis. Unlike theoretical knowledge (*epistēmē*) or technical expertise (*technē*), practical wisdom concerns the capacity to deliberate appropriately in situations where universal rules prove insufficient. Phronesis therefore involves contextual judgement, ethical discernment, and the ability to identify responsible courses of action under conditions of uncertainty. It enables individuals to weigh competing values and to act in ways that are both prudent and ethically justified.

The second tradition is represented by orientation pedagogy and the Life Design paradigm, (Savicksas et al., 2009) both of which interpret orientation as a lifelong educational process of identity construction, agency development, and life-project formation. These perspectives have significantly expanded the educational meaning of orientation by emphasising learners' active role in constructing meaningful biographies. Their contribution is particularly relevant because they relocate educational orientation within everyday teaching rather than confining it to vocational guidance or transitional support. However, while these approaches explain how individuals progressively construct coherent life narratives, they devote comparatively less attention to the educational development of the practical judgement required to evaluate ethically complex situations.

A third theoretical foundation is provided by hermeneutic philosophy (Gadamer, 2004) especially the dialogical conception of understanding. From this perspective, interpretation is an active encounter between reader, text, and lived experience through which new

understanding continuously emerges (Eco, 1979). Educationally, this implies that literary interpretation becomes a transformative process in which learners critically examine both the text and themselves. Classical narratives consequently function as objects of literary analysis and also as interpretative spaces where students explore enduring ethical questions while simultaneously reinterpreting their own experiences. Within educational settings, literary texts become occasions for reflective dialogue, inviting learners to confront moral dilemmas that remain permanently open rather than offering definitive answers. Their educational value lies precisely in this capacity to stimulate judgement, interpretation, and ethical imagination.

The fourth tradition concerns narrative theories of identity (Bruner, 1991; Ricoeur, 1992). Although differing in emphasis, these authors share the assumption that identity develops through narrative interpretation rather than through static psychological characteristics. Individuals construct coherent understandings of themselves by organising experience into meaningful narratives that integrate memory, present action, and future aspirations. Within educational contexts, autobiographical narration (Demetrio, 1996) therefore becomes more than an expressive activity: it represents a reflective process through which learners attribute meaning to experience, negotiate values, and progressively develop agency. This narrative dimension is essential because educational orientation presupposes the capacity to interpret one's own life as an evolving project and not as sequence of isolated events. Similarly, studies on narrative orientation emphasise storytelling as a pedagogical process that supports educational decision-making by encouraging reflective interpretation (Batini, 2011). From this perspective, individuals continually organise, reinterpret, and integrate them into coherent narratives through which they understand themselves and orient their future actions. Narratives organise events into meaningful sequences that connect intentions, actions, consequences, and values. Through this interpretative process, learners gradually develop coherent understandings of themselves and of the social worlds they inhabit.

Finally, the framework incorporates philosophical dialogue, drawing upon Lipman's Community of Inquiry (Lipman, 2003). Collective inquiry provides the educational context in which individual interpretations are examined, questioned, justified, and refined through dialogue with others. Philosophical dialogue encourages learners to compare perspectives, evaluate arguments, and recognise the complexity of ethical deliberation. In doing so, it transforms reflection from an exclusively individual process into a democratic educational practice that cultivates intellectual openness, critical judgement, and shared responsibility.

Considered together these contributions reveal a common educational concern that has not yet been fully conceptualised: the intentional cultivation of practical wisdom through disciplinary learning. It is precisely from this convergence that the present study develops the construct of Orientative Phronesis understood as the educational competence through which learners integrate hermeneutic understanding, narrative self-reflection, ethical deliberation, and responsible orientation within a coherent pedagogical process. This integrated perspective provides the theoretical bridge between the educational aims of Global Citizenship Education and the pedagogical possibilities offered by the humanities.

Individuals develop the capacity to projecting themselves towards the future precisely because they continuously revise the meanings attributed to their past. Educational orientation therefore cannot be separated from narrative interpretation, since every educational choice presupposes an understanding of who one has become and who one aspires to become.

Nevertheless, narrative interpretation alone does not fully explain how learners move from self-understanding to ethically responsible action. Constructing coherent narratives does not automatically entail the capacity to evaluate competing values, deliberate prudently, or assume responsibility for complex decisions. This observation reveals an important theoretical limitation. If narrative identity explains how individuals interpret themselves, an additional educational perspective is required to explain how such interpretation develops into practical judgement. It is precisely this transition—from narrative understanding to ethical deliberation—that directs attention to the educational significance of phronesis as the next step in the present theoretical framework.

While narrative and hermeneutic perspectives explain how learners construct meaning and develop coherent identities, they do not fully account for the educational processes through which individuals learn to make ethically responsible decisions in situations characterised by ambiguity, uncertainty, and conflicting values. Contemporary educational contexts increasingly require students to exercise judgement when no predetermined solution is available. This challenge directs attention to Aristotle's concept of phronesis.

Defining Phronesis

In the Nicomachean Ethics, Aristotle distinguishes practical wisdom (*phronesis*) from both theoretical knowledge (*epistēmē*) and technical competence (*technē*). Whereas theoretical knowledge concerns universal truths and technical expertise aim at the effective production of predetermined outcomes, practical wisdom enables individuals to deliberate about actions whose moral significance depends upon the specific circumstances in which they occur. Practical judgement therefore cannot be reduced to the application of abstract principles or procedural rules. Instead, it requires the capacity to interpret context, evaluate competing values, anticipate consequences, and identify courses of action that are ethically appropriate within particular situations.

From this perspective, practical wisdom represents an indispensable educational resource because it enables learners to navigate situations in which correct answers cannot be determined in advance and where responsible action depends upon thoughtful deliberation rather than procedural certainty.

Conception of subjectification (Biesta, 2020, 2022) further reinforces this educational perspective by emphasising that one of the fundamental purposes of education consists in supporting the emergence of individuals capable of acting responsibly within a pluralistic world. Education, therefore must create opportunities for learners to exercise freedom responsibly, encounter different perspectives, and assume ownership of their decisions. Educational judgement consequently becomes inseparable from ethical responsibility, requiring learners to engage with uncertainty rather than simply applying externally prescribed solutions.

The educational relevance of practical wisdom becomes particularly evident within contemporary technological innovation, artificial intelligence, and increasing cultural complexity continuously confront young people with situations in which multiple legitimate perspectives coexist and predetermined responses prove insufficient. Under these conditions, responsible citizenship depends less upon the accumulation of information than upon the capacity to deliberate critically, justify one's decisions in the hybrid infosphere (Floridi, 2014).

Nevertheless, little attention has been devoted to the pedagogical environments through which it may be intentionally cultivated within ordinary disciplinary teaching. Practical wisdom is frequently presented as a desirable educational outcome, yet the concrete educational processes capable of fostering its development remain comparatively underexplored. This unresolved question is particularly significant for humanities education, where literary interpretation, ethical reflection, and dialogue naturally converge. The present study argues that classical literature offers uniquely favourable conditions for cultivating practical judgement.

The Orientative Function of Classical Literatures in Cultivating Phronesis

Unlike approaches based on the transmission of prescriptive moral norms, classical narratives rarely distinguish clearly between right and wrong. Instead, they present conflicts in which legitimate values collide and every possible decision entail ethical consequence. Literary figures such as Antigone, Odysseus, Aeneas, Medea, Hector, and Penelope do not function as moral exemplars to be imitated uncritically; rather, they embody the complexity of human action, requiring readers to interpret motives, evaluate competing responsibilities, and consider alternative courses of action. In doing so, literature becomes an educational space in which ethical reflection develops through interpretation rather than prescription.

This interpretative openness is particularly significant from a pedagogical perspective. Classical narratives encourage learners to suspend immediate judgement, recognise the plurality of perspectives, and appreciate the contextual nature of moral deliberation. Such experiences cultivate habits of reflection that are fundamental for democratic participation, where responsible decision-making frequently requires balancing competing principles rather than applying predetermined rules. Literary interpretation therefore becomes an educational exercise in practical judgement, preparing learners to confront uncertainty with intellectual openness and reflect upon the consequences of different choices.

Literary interpretation is therefore the beginning of a broader educational process through which disciplinary knowledge is progressively connected with autobiographical reflection and responsible action. In this way, the study of classical literature contributes simultaneously to intellectual development, ethical formation, and educational orientation, demonstrating how the humanities can respond to the contemporary educational challenges identified by Global Citizenship Education.

This observation leads directly to the central theoretical question addressed by the present study: how can humanities education intentionally cultivate practical wisdom as an Orientative educational competence capable of supporting responsible judgement in contemporary democratic societies? The following section develops this argument by identifying the theoretical gap from which the construct of Orientative Phronesis emerges.

However, an important theoretical question remains insufficiently addressed. Existing research rarely explains how disciplinary learning itself—and particularly the study of classical humanities—may intentionally cultivate practical wisdom through coherent pedagogical processes. Narrative identity does not necessarily lead to ethical judgement; learner agency does not automatically imply responsible deliberation; and the recognition of practical wisdom as an educational objective does not, by itself, identify the pedagogical conditions through which it may be systematically developed in ordinary classroom practice. Consequently, the relationship between disciplinary learning, ethical reflection, autobiographical interpretation, and educational orientation remains conceptually fragmented.

To address this theoretical gap, the present study proposes Orientative Phronesis as a novel educational construct situated at the intersection of these theories Within this framework, practical wisdom is conceptualised as an educational competence that can be intentionally cultivated through carefully designed curricular experiences.

In this perspective, the teachers' role evolves into an epistemic mediator facilitating dialogue between disciplinary knowledge and ethical reflection. The proposed framework also has important implications for teacher education. If orientation constitutes an intrinsic dimension of disciplinary teaching, teachers are required not only to possess subject expertise but also to facilitate inquiry, interpretation, dialogue, and reflective learning. Their educational role progressively shifts from the transmission of knowledge towards the design of learning environments in which students actively construct meaning, compare perspectives, justify their interpretations, and assume responsibility for their educational choices. Such an approach requires pedagogical sensitivity capable of integrating disciplinary competence with ethical and relational dimensions of teaching. The originality of the proposed construct lies in its reinterpretation of practical wisdom as an educational competence that can be intentionally cultivated through curriculum design by teachers.

Orientative Phronesis consequently redefines the relationship between disciplinary knowledge and educational orientation. Knowledge retains its central role within the curriculum, yet its educational significance is expanded through processes of interpretation and deliberation that connect learning with learners' personal, ethical, and civic development. Humanities education, in particular, becomes a privileged environment in which disciplinary study contributes simultaneously to intellectual understanding, identity formation, and responsible participation in democratic life.

This approach recognises learners as active agents who continuously interpret experience, construct meaning, and shape their own biographies through reflective engagement with changing personal and social contexts.

Within the Life Design perspective, orientation is understood as an ongoing process through which individuals develop adaptability, reflexivity, and the capacity to construct meaningful life projects. Likewise, narrative pedagogy has demonstrated that autobiographical reflection enables learners to organise experience into coherent narratives, thereby strengthening self-awareness and supporting educational decision-making. Together, these perspectives have significantly broadened the educational understanding of orientation, moving beyond traditional models centred exclusively on career choice or vocational guidance.

Orientative Phronesis builds upon these contributions while extending their educational implications. Although narrative identity provides an essential foundation for self-understanding, the construction of coherent personal narratives does not necessarily guarantee the capacity to deliberate responsibly when confronted with ethically complex situations. Individuals may successfully interpret their experiences without fully developing the practical judgement required to evaluate conflicting values, recognise the consequences of alternative actions, or justify their decisions within pluralistic contexts. Narrative understanding, therefore, represents a necessary but not sufficient condition for responsible educational orientation.

The proposed framework redefines orientation as a continuous pedagogical process accompanying learning rather than as an intervention limited to specific educational transitions. Every learning experience potentially contributes to learners' capacity to interpret themselves,

evaluate alternative possibilities, and construct meaningful educational trajectories. Consequently, orientation becomes inseparable from curriculum design itself, encouraging teachers to conceive disciplinary knowledge not only as an end in itself but also as a resource for reflective judgement and personal development.

The Narrative Orientation Laboratory (NOL)

The Narrative Orientation Laboratory (NOL) operationalises the theoretical construct and translate its conceptual dimensions into a coherent pedagogical model for secondary humanities education. The laboratory reinterprets ordinary disciplinary teaching as a reflective educational process in which literary study becomes a means of cultivating ethical judgement and self-orientation.

The activity is designed around three sequential yet dynamically interconnected pedagogical phases. Although analytically distinguishable, these phases form a continuous educational process through which learners move progressively from textual interpretation to personal reflection and, finally, to responsible deliberation. Each phase prepares the conditions for the next, allowing practical wisdom to emerge gradually through sustained educational experience rather than through isolated instructional activities.

The first phase consists of the hermeneutic interpretation of classical narratives. Students engage with literary episodes characterised by significant ethical complexity, identifying the dilemmas, conflicting values, motivations, and alternative courses of action represented in the text. Literary interpretation is therefore understood not simply as textual analysis but as an educational exercise in ethical perception. By examining situations in which legitimate values come into tension, learners begin to recognise that responsible judgement requires interpretation rather than the application of predetermined rules.

The second phase introduces autobiographical meaning-making (Demetrio, 1996). Through reflective writing, learners relate the ethical questions emerging from the literary text to their own experiences, educational choices, and personal values. By connecting narrative experience with lived experience, students gradually become aware of the assumptions, values, and responsibilities that shape their own decision-making processes. Literary interpretation thus evolves into self-understanding, strengthening the Orientative dimension of disciplinary learning.

The third phase consists of philosophical dialogue. Students compare interpretations, justify arguments, examine alternative perspectives, and critically evaluate the reasons supporting different positions. Dialogue is not directed towards consensus or the identification of a single correct answer; rather, it functions as a shared process of inquiry through which individual interpretations are refined through encounter with others. In this way, ethical reflection becomes simultaneously personal and democratic, inclusive deliberation, and autonomy.

An illustrative example may clarify the educational dynamics of the laboratory. During the study of Sophocles' Antigone, students begin by examining the conflict between Antigone's duty toward her brother and Creon's responsibility to uphold civic authority. Rather than identifying one character as morally right and the other as wrong, they analyse the competing values represented in the tragedy—justice, loyalty, law, responsibility, conscience, and political order—and discuss why the conflict resists simple solutions. In the autobiographical phase, learners are invited to reflect upon situations in which they experienced tension between

institutional rules and personal convictions, exploring how they interpreted those experiences and the values that informed their decisions. The subsequent philosophical dialogue encourages students to compare their interpretations, justify their reasoning, and reconsider their initial assumptions in light of alternative perspectives. Through this progressive movement from literary interpretation to autobiographical reflection and collective inquiry, the tragedy becomes an educational environment in which learners exercise the interpretative, ethical, narrative, and orientative dimensions of Phronesis.

Table 1
The Narrative Orientation Laboratory (NOL) Phases and Orientative Outcomes

Phase	Educational Activity	Orientative Outcome
Hermeneutic reading	Interpretation of ethical dilemmas in classical narratives	Interpretative understanding
Autobiographical Writing	Reflective narrative self-analysis	Self-awareness and agency
Philosophical Dialogue	Community of inquiry and ethical deliberation	Practical judgement and responsible orientation

The educational dynamics of the model unfold through a progressive movement. Hermeneutic interpretation initially encourages learners to suspend immediate judgement and to recognise the plurality of meanings embedded within literary narratives. Rather than seeking definitive answers, students learn to examine ambiguity, identify conflicting values, and appreciate the contextual nature of ethical decision-making. Interpretation thus becomes the first educational condition for the development of practical wisdom.

Autobiographical reflection subsequently transforms literary understanding into personal meaning. By relating the ethical questions emerging from classical narratives to their own educational experiences, learners progressively clarify the values, assumptions, and aspirations that shape their decisions. Reflection therefore extends beyond the comprehension of literary texts, becoming a process through which disciplinary learning contributes to self-understanding and to the construction of coherent educational trajectories.

Philosophical dialogue completes this educational movement by exposing individual interpretations to critical discussion within a shared community of inquiry. Through the comparison of different perspectives, learners are invited to justify their arguments, reconsider their assumptions, and recognise the legitimacy of alternative interpretations. Dialogue consequently strengthens reflective judgement by demonstrating that responsible decisions emerge through reasoned deliberation rather than through the uncritical acceptance of predetermined positions.

Taken together, these educational processes enable learners to move progressively from understanding literary experience to interpreting their own experience and, ultimately, to exercising responsible judgement in relation to future choices.

Future Research

The present study is intentionally conceptual and therefore does not provide empirical evidence concerning the educational effectiveness of the proposed framework. Its primary objective has been to develop a theoretically coherent pedagogical model capable of integrating contributions from orientation pedagogy, into a unified educational perspective. Accordingly, the construct

of Orientative Phronesis should be understood as a conceptual proposal that requires systematic empirical investigation before definitive conclusions concerning its educational impact can be drawn.

Future research will focus on the implementation of the Narrative Orientation Laboratory within secondary humanities education through iterative Design-Based Research cycles. Such studies will enable the progressive refinement of the proposed framework while examining the educational processes through which practical wisdom develops during classroom activity. Particular attention should be devoted to documenting how literary interpretation, autobiographical reflection, and philosophical dialogue interact in supporting learners' ethical judgement, reflective agency, and educational orientation.

Qualitative approaches—including classroom observation, reflective journals, autobiographical narratives, focus groups, and transcripts of philosophical dialogue—appear particularly appropriate for investigating the developmental processes underlying Orientative Phronesis. At the same time, mixed-methods designs integrating qualitative evidence with validated instruments measuring agency, reflective competence, ethical reasoning, and orientation outcomes may contribute to strengthening the empirical validation of the proposed framework while preserving the complexity of the educational phenomena under investigation.

Further research may also explore the transferability of the Narrative Orientation Laboratory across different curricular disciplines, educational systems, and cultural contexts. Although the present study focuses specifically on classical humanities, the pedagogical principles underlying the framework may prove applicable wherever disciplinary learning invites interpretation and ethical reflection about choices.

Conclusion

The educational challenges of the twenty-first century require education to prepare learners to interpret complexity, exercise ethical judgement, and assume responsibility for their decisions within increasingly uncertain social contexts. In this perspective, educational orientation can no longer be conceived primarily as vocational guidance or support for educational transitions. Rather, it becomes a constitutive dimension of teaching through which disciplinary learning. Orientative Phronesis may be defined as the educational competence through which learners integrate interpretative understanding, narrative self-construction, ethical deliberation, and responsible agency in order to orient themselves within uncertain personal and social contexts.

This study has argued that classical humanities offer particularly favourable conditions for achieving this educational objective. Through the hermeneutic interpretation of literary narratives, autobiographical reflection, and philosophical dialogue, the study of Greek and Latin literature may become an educational environment in which learners progressively develop the capacity to interpret ethically complex situations, construct meaningful understandings of themselves, and orient their future choices responsibly.

In this sense, Orientative Phronesis represents also a pedagogical horizon through which humanities education may contribute meaningfully to the formation of reflective citizens capable of navigating the complexity of the contemporary world.

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

No AI or AI-assisted technologies were used in the preparation of this manuscript.

References

Aristotle. (2004). *Nicomachean ethics* (R. Crisp, Trans.). Cambridge University Press. (Original work published ca. 350 BCE)

Batini, F. (2011). *Narrazione e sviluppo della persona* [Narrative and Personal Development]. Erickson.

Bauman, Z. (2000). *Liquid modernity*. Polity Press.

Bertagna, G. (2023). *Pedagogia generale. Educazione come teoria e pratica della persona* [General Pedagogy: Education as Theory and Practice of the Person]. Studium.

Biesta, G. J. J. (2020). *Risking ourselves in education: Qualification, socialization, and subjectification revisited. Educational Theory, 70*(1), 89–104. https://doi.org/10.1111/edth.12411

Biesta, G. J. J. (2022). *World-centred education: A view for the present*. Routledge.

Bruner, J. (1991). The narrative construction of reality. *Critical Inquiry*, *18*(1), 1–21.

Bruni, E. M. (2021). *Ispirarsi alla paideia. I modelli classici nella formazione* [Drawing Inspiration from Paideia: Classical Models in Education]. Carocci.

Bruni, E. M. (2023). Phronesis, Bildung e formazione [Phronesis, Bildung, and Education]. *Scholé, 9*(1), 123–140.

Demetrio, D. (1996). *Raccontarsi: L'autobiografia come cura di sé* [Telling One's Story: Autobiography as a Self-Care]. Raffaello Cortina.

Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher, 32*(1), 5–8. https://doi.org/10.3102/0013189X032001005

Eco, U. (1979). *Lector in fabula*. Bompiani.

Floridi, L. (2014). *The fourth revolution. How the infosphere is reshaping human reality*. Oxford University Press.

Gadamer, H.-G. (2004). *Truth and method* (2nd rev. ed., J. Weinsheimer & D. G. Marshall, Trans.). Continuum.

Guichard, J. (2005). Life-long self-construction. *International Journal for Educational and Vocational Guidance, 5*(2), 111–124. https://doi.org/10.1007/s10775-005-8789-y

Hansen, D. T. (2008). *The teacher and the world: A study of cosmopolitanism as education.* Routledge.

Jonas, H. (1984). *The imperative of responsibility: In search of an ethics for the technological age.* University of Chicago Press.

Kristjánsson, K. (2007). *Aristotle, emotions, and education*. Ashgate.

Lipman, M. (2003). *Thinking in education* (2nd ed.). Cambridge University Press.

Morin, E. (2000). *Seven complex lessons in education for the future*. UNESCO.

Nussbaum, M. C. (1997). *Cultivating humanity: A classical defence of reform in liberal education.* Harvard University Press.

Nussbaum, M. C. (2010). *Not for profit: Why democracy needs the humanities*. Princeton University Press.

OECD. (2020). *OECD Learning Compass 2030.* OECD Publishing.

Reeves, T. C. (2006). Design research from a technology perspective. In J. van den Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Eds.), *Educational design research* (pp. 52–66). Routledge.

Ricoeur, P. (1992). *Oneself as another*. University of Chicago Press.

Savickas, M. L. (2005). *The theory and practice of career construction*. In S. D. Brown & R. W. Lent (Eds.), Career development and counseling: Putting theory and research to work (pp. 42–70). John Wiley & Sons.

Savickas, M. L., Nota, L., Rossier, J., Dauwalder, J.-P., Duarte, M. E., Guichard, J., Soresi, S., Van Esbroeck, R., & Van Vianen, A. E. M. (2009). Life designing: A paradigm for career construction in the 21st century. *Journal of Vocational Behaviour, 75*(3), 239–250. https://doi.org/10.1016/j.jvb.2009.04.004

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.

Sen, A. (1999). *Development as freedom*. Oxford University Press.

UNESCO. (2015). *Global citizenship education: Topics and learning objectives*. UNESCO.

UNESCO. (2021). *Reimagining our futures together: A new social contract for education*. UNESCO.

Preparing the Data-Driven Healthcare Workforce: A PRISMA-Guided Review of Big Data Analytics and Educational Implications

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Abstract

The rapid expansion of Electronic Health Records has accelerated the integration of Big Data Analytics (BDA) and Artificial Intelligence (AI) into healthcare systems, transforming clinical decision-making and personalised healthcare. However, the increasing reliance on advanced analytics introduces substantial challenges related to data governance, cybersecurity, ethical accountability, and workforce preparedness. This review is guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework and structured using the Population, Intervention, Comparator, Outcome, Study Design, and Setting (PICOSS) framework, synthesising peer-reviewed literature published between 2013 and 2023 to examine the benefits, technologies, and challenges associated with BDA in healthcare. Out of the 2,969 retrieved studies, 35 met the inclusion criteria. Findings indicate that BDA enhances predictive capabilities, personalised healthcare delivery, and operational efficiency. Persistent barriers include data governance and quality management concerns, cybersecurity risks, and ethical challenges related to algorithmic bias, accountability, privacy, and limited transparency. Advanced technologies, including machine learning, deep learning, and federated learning, are central to implementation but require specialised competencies. These findings highlight important implications for education, including the need to strengthen AI literacy, ethical governance of algorithms, and interdisciplinary training to support the responsible adoption of data-driven technologies. These findings highlight the importance of embedding data governance, cybersecurity awareness, and ethical AI frameworks into higher education curricula to prepare future professionals for responsible, sustainable, data-driven practices.

Keywords: big data analytics, higher education, AI literacy, workforce readiness, responsible AI

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Introduction

The rapid digitalisation of healthcare data has resulted in unprecedented growth in the volume, variety, and complexity of healthcare data. Electronic health records (EHRs), medical imaging, genomic information, wearable technologies, and Internet of Things (IoT) devices continuously generate structured, semi-structured, and unstructured datasets that are increasingly difficult to manage using conventional analytical approaches (Chawla & Davis, 2013; Raghupathi & Raghupathi, 2014). The widespread adoption of Big Data Analytics (BDA), supported by advances in artificial intelligence (AI) and machine learning (ML), has created new opportunities to transform healthcare delivery through data-driven decision-making, predictive modelling, personalised healthcare, and operational improvements (Awrahman et al., 2022; Jiang et al., 2017).

The integration of AI-enabled analytics into healthcare has accelerated in recent years, particularly following the COVID-19 pandemic, where large-scale data analysis supported disease surveillance, outbreak monitoring, clinical decision-making, and healthcare planning (Arora et al., 2021; Firouzi et al., 2021; Vaishya et al., 2020). At the same time, advances in natural language processing, deep learning, federated learning, and data mining have expanded healthcare organisations' ability to extract meaningful insights from increasingly complex datasets (J. S. Chen & Baxter, 2022; Yang, Soltan, Eyre, Yang, et al., 2023). These developments position BDA as a key enabler of precision medicine and data-driven healthcare.

Despite these opportunities, the implementation of BDA presents significant technical, organisational, and ethical challenges. Healthcare organisations must address issues relating to data quality, interoperability, governance, cybersecurity, patient privacy, and algorithmic bias while ensuring that AI systems remain transparent, trustworthy, and aligned with ethical principles (Awrahman et al., 2022; Garattini et al., 2019; Norori et al., 2021). The responsible adoption of AI, therefore, depends not only on technological capability but also on effective governance and an appropriately prepared workforce that can critically evaluate and apply data-driven technologies in clinical practice.

Although the technological applications of BDA in healthcare have been widely explored, comparatively less attention has been given to their implications for preparing the future workforce. As AI-enabled technologies become increasingly embedded within systems, higher education institutions play a critical role in equipping graduates with competencies that extend beyond technical proficiency to include AI literacy, data governance, cybersecurity, ethical AI, and interdisciplinary collaboration. These capabilities are essential for supporting the responsible implementation of BDA and fostering confidence in data-informed clinical decision-making.

This study presents a PRISMA-guided review of the literature published between 2013 and 2023 to examine the benefits, enabling technologies, and challenges associated with BDA in healthcare. Building on this evidence, the review considers the educational implications for preparing a future-ready workforce to support the safe, ethical, and effective adoption of AI-enabled, data-driven healthcare.

Literature Review

Big Data and its analysis have become increasingly important in healthcare due to the rapid expansion of electronic health records, medical imaging, genomic data, and other structured,

semi-structured, and unstructured datasets. Across the 35 studies included in the review, BDA was most frequently associated with three areas of benefit: predictive capabilities, personalised healthcare, and cost efficiency.

The review identifies predictive capabilities and personalised healthcare as the two most frequently reported benefits, each appearing in 11 of the 35 included studies, representing 31% of the reviewed evidence. Cost reduction appeared in four studies, representing 11% of the included literature. The literature suggests that BDA can support predictive healthcare by identifying patterns, trends, risks, and potential outcomes and by analysing large datasets. Studies reported that BDA has been used to monitor infectious disease outbreaks, assess treatment risks, predict patient readmission, support public health interventions, and improve clinical decision-making (Arora et al., 2021; Awrahman et al., 2022; Chawla & Davis, 2013; J. S. Chen & Baxter, 2022; Firouzi et al., 2021; Garattini et al., 2019; Jiang et al., 2017; Majnarić et al., 2021; Tenali & Babu, 2023; Vaishya et al., 2020; Xiong et al., 2022). During the COVID-19 pandemic, BDA, machine learning, IoT, and AI-enabled tools were used to support surveillance, diagnosis, hotspot identification, disease monitoring, vaccine development, and treatment planning (Arora et al., 2021; Firouzi et al., 2021; Vaishya et al., 2020).

BDA enables the aggregation and analysis of electronic health records, genomic data, imaging data, and real-time biometric information to support individualised risk profiling, precision medicine, and tailored treatment strategies (Chawla & Davis, 2013; Jagadeeswari et al., 2018; Raghupathi & Raghupathi, 2014; Viceconti et al., 2015). Studies have also linked BDA to patient-centred care, earlier identification of disease risk, targeted therapies, and improved treatment planning (Cheung et al., 2019; Grossglauser & Saner, 2014; Lemmen et al., 2021; Murphy & Saleh, 2020; Norori et al., 2021). The dissertation also identifies the use of technologies such as Hadoop, Spark, and Virtual Physiological Human (VPH) models to support complex data processing for personalised and in silico medicine solutions (Viceconti et al., 2015; Xiong et al., 2022). Another group of studies linked BDA to operational efficiency and cost reduction. These studies suggest that BDA may support earlier detection of health risks, remote monitoring, chronic disease management, and improved resource allocation (Grossglauser & Saner, 2014; Jagadeeswari et al., 2018; Raghupathi & Raghupathi, 2014; Xiong et al., 2022).

The review identifies machine learning and artificial intelligence as the most frequently discussed enabling technologies. Machine learning and AI were reported as central to extracting insights, identifying patterns, making predictions, and supporting healthcare decision-making (Arora et al., 2021; Babel et al., 2021; Benke & Benke, 2018; J. S. Chen & Baxter, 2022; S. W. Chen et al., 2021; D'Costa & Zatale, 2021; Golas et al., 2018; Hulsen, 2022; Jiang et al., 2017; Majnarić et al., 2021; Murphy & Saleh, 2020; Tenali & Babu, 2023; Yang, Soltan, Eyre, Yang, et al., 2023). Natural language processing (NLP) was identified as particularly important for converting unstructured data into analysable data, supporting medication adherence, ophthalmology, clinical documentation, and decision-making (Babel et al., 2021; J. S. Chen & Baxter, 2022; D'Costa & Zatale, 2021; Hulsen, 2022; Jiang et al., 2017; Majnarić et al., 2021).

Deep learning, neural networks, convolutional neural networks, and artificial neural networks were reported as useful for analysing complex medical images, detecting conditions such as diabetic retinopathy, and identifying patterns within large datasets (Arora et al., 2021; Benke & Benke, 2018; J. S. Chen & Baxter, 2022; Golas et al., 2018; Jiang et al., 2017; Murphy &

Saleh, 2020). Federated learning and reinforcement learning were also identified as emerging approaches, particularly for privacy-preserving predictive modelling and algorithmic fairness in clinical machine learning (Yang, Soltan, Eyre, Yang, et al., 2023).

Data mining was presented as a method for extracting patterns and relationships from large datasets. It was associated with patient data analysis, risk identification, pharmacovigilance, decision support, and the detection of links between medications and side effects (Benke & Benke, 2018; Grossglauser & Saner, 2014; Raghupathi & Raghupathi, 2014; Ross et al., 2014; Tenali & Babu, 2023; Xiong et al., 2022) Hadoop was identified as a framework for processing large-scale data, supporting scalability, computational efficiency, and the management of high-volume datasets (Hammad et al., 2020; Tenali & Babu, 2023; Xiong et al., 2022; Zhou et al., 2020).

The review identifies three major challenge areas: data quality and management, security, and ethical concerns. Data quality and management appeared in 17 studies, representing 48% of the included literature. Security concerns were reported in 14 studies (40%), and ethical concerns in 10 (29%). Data quality and management challenges included data standardisation, accuracy, ownership, governance, unstructured data, interoperability, and the difficulty of managing data across multiple platforms and formats (Akhtar et al., 2020; Awrahman et al., 2022; Babel et al., 2021; Benke & Benke, 2018; Chawla & Davis, 2013; Cheung et al., 2019; D'Costa & Zatale, 2021; Del Rio-Bermudez et al., 2020; Garattini et al., 2019; Grossglauser & Saner, 2014; Hammad et al., 2020; Hulsen, 2022; Jiang et al., 2017; Majnarić et al., 2021; Murphy & Saleh, 2020; Tenali & Babu, 2023; Viceconti et al., 2015). These challenges are important to address because poor-quality or poorly governed data can undermine the reliability of BDA and AI-enabled decision-making.

Security was another major concern. The reviewed studies highlighted risks related to unauthorised access, privacy breaches, data ownership, cloud computing, cyberattacks, and the protection of sensitive medical records (Awrahman et al., 2022; Babel et al., 2021; Benke & Benke, 2018; Chawla & Davis, 2013; Grossglauser & Saner, 2014; Hammad et al., 2020; Hulsen, 2022; Jagadeeswari et al., 2018; Lemmen et al., 2021; Murphy & Saleh, 2020; Raghupathi & Raghupathi, 2014; Ross et al., 2014; Xiong et al., 2022; Zhou et al., 2020). These findings indicate that cybersecurity awareness and data protection should be treated as core competencies for professionals working in data-driven healthcare environments.

Ethical concerns included privacy, consent, autonomy, bias, accountability, transparency, algorithmic fairness, and the use of black-box AI systems (Arora et al., 2021; Di Nucci, 2019; Dove et al., 2022; Garattini et al., 2019; Hulsen, 2022; Lemmen et al., 2021; Murphy & Saleh, 2020; Norori et al., 2021; Yang, Soltan, Eyre, Yang, et al., 2023). The reviewed literature raises particular concern about bias in AI and machine learning systems, especially when underrepresented groups are inadequately represented in training datasets. Explainable AI is therefore presented as an important response to concerns about transparency and trust, although the dissertation notes that highly complex models may remain difficult to interpret fully. Although the review focuses primarily on BDA in healthcare, its findings clearly point to an educational gap. The reviewed literature demonstrates that responsible use of BDA depends not only on technical tools but also on workforce capabilities in AI literacy, data governance, cybersecurity, ethical reasoning, and interdisciplinary collaboration.

Methodology

This review employed a PRISMA-guided rapid review to synthesise evidence on the application of BDA in healthcare and its educational implications for workforce preparedness. Several evidence synthesis approaches, including systematic, narrative, rapid, and scoping reviews, were considered during the study design. A rapid review was selected because it provides a structured and transparent synthesis of evidence within a shorter timeframe while maintaining methodological rigour, making it appropriate for addressing emerging topics such as BDA and artificial intelligence (AI) in healthcare (Boland, Angela; Cherry, M. Gemma; Dickson, 2014). Reporting followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses to ensure transparency, reproducibility, and consistency throughout the review process (Page et al., 2021).

Eligibility Criteria

Study selection was guided by the Population, Intervention, Comparator, Outcomes, Study Design and Setting (PICOSS) framework, an extension of the Population, Intervention, Comparator and Outcomes (PICO) framework commonly used in evidence-based research (Boland, Angela; Cherry, M. Gemma; Dickson, 2014). The PICOSS framework was used to establish explicit inclusion and exclusion criteria before commencing the literature search.

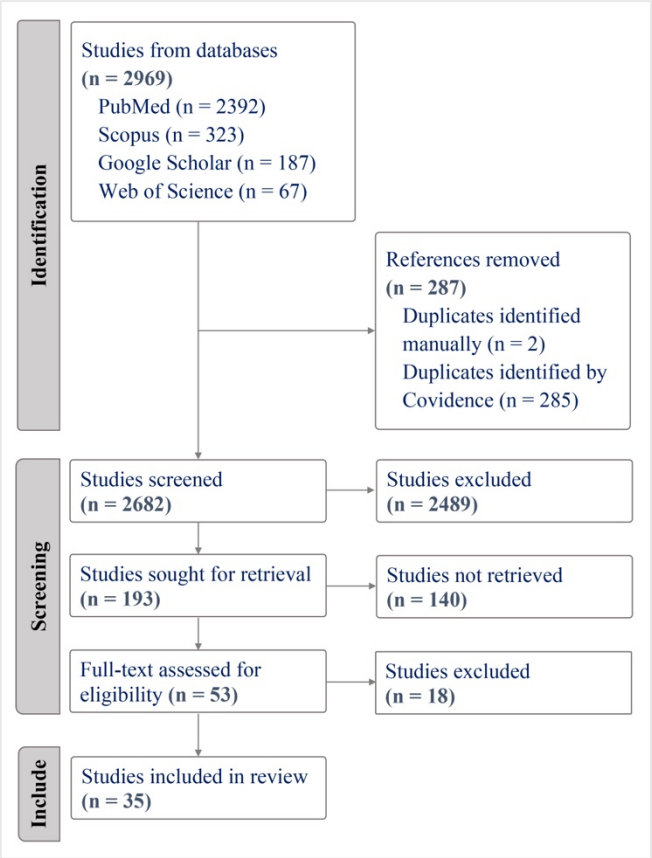
Eligible studies included patients, healthcare providers, data scientists, machine learning researchers, and ethicists. The intervention focused on the application of Big Data, machine learning, and artificial intelligence in healthcare. Comparators included traditional healthcare approaches and non-optimised analytical methods. Eligible outcomes included improvements in patient experience, personalised treatment, personalised medication, ethical practice, and health insights. Studies published in English between 2013 and 2023 were included to reflect the period during which BDA experienced rapid development within healthcare. Eligible settings comprised hospitals, clinics, healthcare organisations, research laboratories, universities, and healthcare research institutions. Studies conducted outside healthcare settings, studies published before 2013, and studies unrelated to BDA, AI, or machine learning were excluded.

Search Strategy and Study Selection

A comprehensive literature search was undertaken using four electronic databases: PubMed, Scopus, Google Scholar, and Web of Science. PubMed yielded the largest number of potentially eligible studies. Database searches combined Boolean operators and keywords relating to patients, healthcare, Big Data Analytics, Artificial Intelligence, machine learning, personalised healthcare, and ethics. Where appropriate, the American spelling personalized was used because it generated a broader range of search results than the British spelling personalised.

The search identified 2,969 records, which were then imported into Covidence, where titles and abstracts were screened using the predefined PICOSS eligibility criteria (*Covidence – Systematic Review Management*, n.d.). Following initial screening, 193 studies were exported to EndNote 21 for full-text assessment (EndNote 21, n.d.). Fifty-three full-text articles were assessed for eligibility, of which 35 studies satisfied the inclusion criteria and were included in the final review. The study selection process is presented using a PRISMA 2020 flow diagram (Figure 1).

Figure 1
PRISMA Flow Diagram Illustrating the Study Selection Process



Data Extraction and Thematic Synthesis

Data extraction was undertaken using a literature review matrix developed in Microsoft Excel, following the Matrix Method described by Goldman & Schmalz (2004). Each of the 35 included studies was reviewed in full, and key information was extracted, including author, publication year, study methodology, principal findings, and relevance to the research questions. The extracted data were systematically organised to facilitate comparison across studies and to ensure consistency during synthesis.

Recurring concepts and keywords identified within the literature were subsequently grouped into broader thematic categories. Themes were developed iteratively according to the three research questions, examining (1) the benefits of BDA in healthcare, (2) technologies supporting BDA implementation, and (3) challenges associated with BDA adoption. The final thematic framework comprised three benefit themes: predictive capabilities, personalised healthcare, and operational efficiency and cost reduction; three technology themes: machine learning and artificial intelligence, data mining, and Hadoop; and three challenge themes: data quality and governance, security, and ethical concerns. This structured thematic synthesis enabled a transparent and systematic interpretation of the evidence while maintaining direct alignment with the objectives of the review.

Characteristics of Included Studies

The final review included 35 English-language studies published between 2013 and 2023, comprising literature reviews, narrative reviews, rapid reviews, qualitative studies, quantitative

studies, and mixed-methods research. Of the 35 included studies, 30 were peer-reviewed, and 26 were published in journals with impact factors ranging from 1.4 to 23.8. The methodological characteristics of the included studies provided a broad evidence base for the thematic synthesis.

Results

The findings were organised into three themes corresponding to the research questions: (1) benefits of Big Data Analytics (BDA), (2) enabling technologies, and (3) implementation challenges.

Benefits

Three principal benefit themes emerged: predictive capabilities, personalised healthcare, and operational efficiency.

Predictive capabilities were identified in 11 of the 35 included studies (31%). These studies reported using BDA to identify disease trends, support timely interventions, predict patient outcomes, improve clinical decision-making, monitor infectious disease outbreaks, and enhance public health surveillance. During the COVID-19 pandemic, BDA and machine learning were widely applied to disease monitoring, hotspot identification, diagnosis, and healthcare planning (Arora et al., 2021; Awrahman et al., 2022; Chawla & Davis, 2013; J. S. Chen & Baxter, 2022; Firouzi et al., 2021; Garattini et al., 2019; Jiang et al., 2017; Majnarić et al., 2021; Tenali & Babu, 2023; Vaishya et al., 2020; Xiong et al., 2022).

Personalised healthcare was also reported in 11 studies (31%). The included literature demonstrated that BDA supports personalised treatment planning by integrating electronic health records, genomic information, medical imaging, and real-time patient data. Applications included disease risk assessment, precision medicine, targeted interventions, and patient-centred treatment strategies (Awrahman et al., 2022; Chawla & Davis, 2013; Cheung et al., 2019; Grossglauser & Saner, 2014; Jagadeeswari et al., 2018; Lemmen et al., 2021; Murphy & Saleh, 2020; Norori et al., 2021; Raghupathi & Raghupathi, 2014; Viceconti et al., 2015; Xiong et al., 2022).

Operational efficiency was identified in 4 studies (11%), where BDA was associated with improved resource allocation, remote patient monitoring, chronic disease management, earlier detection of health conditions, and reductions in healthcare expenditure through more efficient treatment pathways (Grossglauser & Saner, 2014; Jagadeeswari et al., 2018; Raghupathi & Raghupathi, 2014; Xiong et al., 2022).

Technologies

Machine learning and artificial intelligence were the most frequently reported enabling technologies, appearing in 13 studies (37%). The reviewed literature identified applications including natural language processing, deep learning, reinforcement learning, federated learning, deep neural networks, convolutional neural networks, and artificial neural networks for predictive modelling, clinical decision support, medical image analysis, disease detection, and pattern recognition (Arora et al., 2021; Babel et al., 2021; Benke & Benke, 2018; J. S. Chen & Baxter, 2022; S. W. Chen et al., 2021; D'Costa & Zatale, 2021; Golas et al., 2018; Hulsen,

2022; Jiang et al., 2017; Majnarić et al., 2021; Murphy & Saleh, 2020; Tenali & Babu, 2023; Yang, Soltan, Eyre, Yang, et al., 2023).

Data mining was reported in 6 studies (17%). It was used to identify patterns within healthcare datasets, support pharmacovigilance, improve clinical decision-making, and facilitate predictive analytics through AI-based algorithms and distributed computing platforms (Benke & Benke, 2018; Grossglauser & Saner, 2014; Raghupathi & Raghupathi, 2014; Ross et al., 2014; Tenali & Babu, 2023; Xiong et al., 2022).

Hadoop appeared in 4 studies (11%) as a scalable framework for managing high-volume healthcare datasets, supporting distributed storage, computational efficiency, and large-scale data processing (Xiong et al., 2022; Tenali & Babu, 2023; Hammad et al., 2020; Zhou et al., 2020).

Challenges

Three major themes of challenge emerged from the review: data quality and governance, security, and ethical concerns.

Data quality and governance represented the most frequently reported challenge, appearing in 17 studies (48%). Reported issues included data quality, ownership, interoperability, standardisation, governance, storage, and the management of structured and unstructured healthcare data (Akhtar et al., 2020; Awrahman et al., 2022; Babel et al., 2021; Benke & Benke, 2018; Chawla & Davis, 2013; Cheung et al., 2019; D'Costa & Zatale, 2021; Del Rio-Bermudez et al., 2020; Garattini et al., 2019; Grossglauser & Saner, 2014; Hammad et al., 2020; Hulsen, 2022; Jiang et al., 2017; Majnarić et al., 2021; Murphy & Saleh, 2020; Tenali & Babu, 2023; Viceconti et al., 2015).

Security concerns were identified in 14 studies (40%), with reported risks including unauthorised access, cybersecurity threats, privacy protection, cloud computing, confidential patient information, and safeguarding electronic health records against data (Awrahman et al., 2022; Babel et al., 2021; Benke & Benke, 2018; Chawla & Davis, 2013; Grossglauser & Saner, 2014; Hammad et al., 2020; Hulsen, 2022; Jagadeeswari et al., 2018; Lemmen et al., 2021; Murphy & Saleh, 2020; Raghupathi & Raghupathi, 2014; Ross et al., 2014; Xiong et al., 2022; Zhou et al., 2020).

Ethical concerns were reported in 10 studies (29%). The included studies identified issues relating to patient privacy, informed consent, algorithmic bias, fairness, accountability, transparency, and the use of "black box" AI systems. Several studies also highlighted Explainable Artificial Intelligence (XAI) as a potential approach to improve transparency and trust in AI-assisted healthcare (Arora et al., 2021; Di Nucci, 2019; Dove et al., 2022; Garattini et al., 2019; Hulsen, 2022; Lemmen et al., 2021; Murphy & Saleh, 2020; Norori et al., 2021; Yang, Soltan, Eyre, & Clifton, 2023; Yang, Soltan, Eyre, Yang, et al., 2023).

Discussion

The findings demonstrate that Big Data Analytics (BDA) has become an important component of contemporary healthcare, supporting predictive capabilities, personalised healthcare, and improvements in operational efficiency. Across the reviewed studies, predictive analytics consistently emerged as one of the most frequently reported benefits, reflecting the growing

use of BDA to identify disease patterns, support clinical decision-making, monitor infectious disease outbreaks, and enable timely healthcare interventions (Arora et al., 2021; Garattini et al., 2019; Majnarić et al., 2021). Likewise, the integration of electronic health records, genomic information, and real-time patient data has enabled more personalised approaches to diagnosis and treatment, reinforcing the transition towards precision medicine and patient-centred care (Chawla & Davis, 2013; Jagadeeswari et al., 2018; Raghupathi & Raghupathi, 2014). Although operational efficiency was identified less frequently, the evidence suggests that BDA can contribute to more effective resource allocation, earlier intervention, and reduced healthcare costs through data-informed decision-making (Grossglauser & Saner, 2014; Raghupathi & Raghupathi, 2014). These findings collectively demonstrate the growing strategic importance of data-driven approaches within healthcare systems.

The review also highlights that these benefits depend on the effective application of enabling technologies, particularly machine learning, artificial intelligence, natural language processing, deep learning, federated learning, and data mining. These technologies increasingly support predictive modelling, medical image analysis, clinical decision support, and the analysis of large healthcare datasets (J. S. Chen & Baxter, 2022; Jiang et al., 2017; Yang, Soltan, Eyre, Yang, et al., 2023). However, the review also indicates that implementing these technologies requires specialised knowledge and technical competencies that extend beyond traditional healthcare practice. As AI-enabled technologies become more widely adopted, healthcare professionals must be equipped to understand both their capabilities and their limitations rather than relying solely on automated outputs.

Despite the reported benefits, the review consistently identified data governance, cybersecurity, and ethical considerations as major barriers to the responsible implementation of BDA. Data quality, interoperability, governance, and the management of increasingly complex healthcare datasets were the most frequently reported challenges, demonstrating that the value of BDA depends fundamentally on the quality and integrity of the underlying data (Awrahman et al., 2022; Hammad et al., 2020). Security concerns, including privacy, cyberattacks, cloud computing vulnerabilities, and protection of electronic health records, further emphasise the need for robust governance frameworks and organisational safeguards (Jagadeeswari et al., 2018; Zhou et al., 2020). In addition, concerns surrounding algorithmic bias, transparency, accountability, and the use of opaque AI systems illustrate that technical capability alone is insufficient to ensure responsible implementation(Di Nucci, 2019; Norori et al., 2021; Yang, Soltan, Eyre, Yang, et al., 2023).

These findings suggest that preparing a future workforce requires more than technical familiarity with AI-enabled technologies. The review indicates that graduates entering increasingly data-driven healthcare environments will require competencies in AI literacy, data governance, cybersecurity, ethical AI, and interdisciplinary collaboration to support the responsible adoption of BDA. While many of the reviewed studies focused primarily on technological implementation, the collective evidence demonstrates that successful adoption depends equally on healthcare professionals' ability to interpret data appropriately, recognise ethical implications, critically evaluate algorithmic outputs, and participate in multidisciplinary decision-making. These findings support the need for higher education programmes to integrate responsible AI and data-informed practice into curriculum design to better align graduate capabilities with the evolving requirements of healthcare systems.

Several limitations should also be considered when interpreting these findings. As a rapid review, the study provides a focused synthesis of the available evidence rather than the

comprehensive coverage expected from a full systematic review. The search was restricted to English-language publications between 2013 and 2023, and the evidence base reflects the technologies and healthcare applications available during that period. Given the rapid development of artificial intelligence and healthcare analytics, new developments may emerge beyond the review timeframe. Consequently, continued research is required to evaluate the long-term implementation of BDA, particularly regarding governance frameworks, responsible AI adoption, and workforce preparation within higher education.

Conclusion

This PRISMA-guided review synthesised evidence from 35 studies published between 2013 and 2023 to examine the benefits, enabling technologies, and challenges associated with Big Data Analytics (BDA) in healthcare and to consider their implications for workforce preparation. The findings demonstrate that BDA supports predictive capabilities, personalised healthcare, and operational efficiency, while its successful implementation depends on technologies such as machine learning, artificial intelligence, data mining, and Hadoop. At the same time, the review consistently identified data governance, cybersecurity, and ethical AI as the principal challenges limiting responsible adoption.

Beyond its technological contribution, the review highlights an important educational implication. As healthcare increasingly relies on AI-enabled and data-driven systems, future healthcare professionals will require competencies that extend beyond clinical expertise. The evidence suggests that workforce readiness should encompass AI literacy, data governance, cybersecurity awareness, ethical AI, and interdisciplinary collaboration to enable graduates to critically evaluate, govern, and responsibly apply data-driven technologies within healthcare practice.

Although BDA offers considerable opportunities to improve healthcare delivery, its benefits can only be realised when supported by robust governance frameworks and a workforce equipped with the knowledge and skills necessary for responsible implementation. Higher education, therefore, has an important role in embedding these competencies within curriculum design to prepare graduates for the evolving demands of data-driven healthcare.

Future research should continue to evaluate emerging AI-enabled technologies, governance frameworks, and educational approaches that strengthen responsible BDA adoption while ensuring healthcare professionals remain prepared for the continuing evolution of digital healthcare systems.

This review concludes that preparing the future healthcare workforce requires not only technological innovation but also the integration of AI literacy, responsible AI, data governance, cybersecurity, and interdisciplinary learning within higher education to support the safe, ethical, and effective use of Big Data Analytics in healthcare.

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

The author declares that:

- RCSI Bahrain – Licensed, ChatGPT-Edu (OpenAI) was used in a limited capacity to assist with condensing and restructuring sections of the manuscript derived from the

author's original dissertation and accepted conference poster to meet the IAFOR Conference Proceedings requirements.

- Grammarly was used for grammar, spelling, punctuation, and stylistic proofreading,
- Mendeley Reference Manager was used to organise references and generate citations in APA 7th edition format.

The use of these tools was limited to editorial support and reference management. The study design, literature search, PRISMA-guided review, data analysis, interpretation of findings, conclusions, and final academic content are the original work of the author.

References

Akhtar, U., Lee, J. W., Bilal, H. S. M., Ali, T., Khan, W. A., & Lee, S. (2020). The Impact of Big Data In Healthcare Analytics. *2020 International Conference on Information Networking (ICOIN)*, 61–63. https://doi.org/10.1109/ICOIN48656.2020.9016588

Arora, G., Joshi, J., Mandal, R. S., Shrivastava, N., Virmani, R., & Sethi, T. (2021). Artificial Intelligence in Surveillance, Diagnosis, Drug Discovery and Vaccine Development against COVID-19. *Pathogens, 10*(8). https://doi.org/10.3390/pathogens10081048

Awrahman, B. J., Aziz Fatah, C., & Hamaamin, M. Y. (2022). A Review of the Role and Challenges of Big Data in Healthcare Informatics and Analytics. *Computational Intelligence and Neuroscience, 2022*, 5317760. https://doi.org/10.1155/2022/5317760

Babel, A., Taneja, R., Mondello Malvestiti, F., Monaco, A., & Donde, S. (2021). Artificial Intelligence Solutions to Increase Medication Adherence in Patients With Non-communicable Diseases. *Front Digit Health, 3*, 669869. https://doi.org/10.3389/fdgth.2021.669869

Benke, K., & Benke, G. (2018). Artificial Intelligence and Big Data in Public Health. *International Journal of Environmental Research and Public Health, 15*(12), 2796. https://www.mdpi.com/1660-4601/15/12/2796

Boland, A., Cherry, M. G., & Dickson, R. (2014). *Doing a Systematic Review - A Student's Guide 2nd Edition*. SAGE Publications Ltd, 527.

Chawla, N. V., & Davis, D. A. (2013). Bringing Big Data to Personalized Healthcare: A Patient-Centered Framework. *Journal of General Internal Medicine, 28*(3), 660–665. https://doi.org/10.1007/s11606-013-2455-8

Chen, J. S., & Baxter, S. L. (2022). Applications of natural language processing in ophthalmology: present and future. *Frontiers in Medicine, 9*, 906554. https://doi.org/10.3389/fmed.2022.906554

Chen, S. W., Gu, X. W., Wang, J. J., & Zhu, H. S. (2021). AIoT Used for COVID-19 Pandemic Prevention and Control. *Contrast Media Mol Imaging, 2021*, 3257035. https://doi.org/10.1155/2021/3257035

Cheung, K. S., Leung, W. K., & Seto, W. K. (2019). Application of Big Data analysis in gastrointestinal research. *World Journal of Gastroenterology, 25*(24), 2990–3008. https://doi.org/10.3748/wjg.v25.i24.2990

Covidence – systematic review management. (n.d.). https://www.covidence.org/

D'Costa, A., & Zatale, A. (2021). AI and the cardiologist: when mind, heart and machine unite. *Open Heart, 8*(2). https://doi.org/10.1136/openhrt-2021-001874

Del Rio-Bermudez, C., Medrano, I. H., Yebes, L., & Poveda, J. L. (2020). Towards a symbiotic relationship between big data, artificial intelligence, and hospital pharmacy. *Journal of Pharmaceutical Policy and Practice, 13*(1), 75. https://doi.org/10.1186/s40545-020-00276-6

Di Nucci, E. (2019). Should we be afraid of medical AI? *Journal of Medical Ethics, 45*(8), 556–558. https://doi.org/10.1136/medethics-2018-105281

Dove, E. S., Reed-Berendt, R., & Pareek, M. (2022). "Data makes the story come to life:" understanding the ethical and legal implications of Big Data research involving ethnic minority healthcare workers in the United Kingdom-a qualitative study. *BMC Med Ethics, 23*(1), 136. https://doi.org/10.1186/s12910-022-00875-9

EndNote 21. (n.d.). EndNote. https://endnote.com/?language=en

Firouzi, F., Farahani, B., Daneshmand, M., Grise, K., Song, J., Saracco, R., Wang, L. L., Lo, K., Angelov, P., Soares, E., Loh, P. S., Talebpour, Z., Moradi, R., Goodarzi, M., Ashraf, H., Talebpour, M., Talebpour, A., Romeo, L., Das, R., … Luo, A. (2021). Harnessing the Power of Smart and Connected Health to Tackle COVID-19: IoT, AI, Robotics, and Blockchain for a Better World. *IEEE Internet of Things Journal, 8*(16), 12826–12846. https://doi.org/10.1109/jiot.2021.3073904

Garattini, C., Raffle, J., Aisyah, D. N., Sartain, F., & Kozlakidis, Z. (2019). Big Data Analytics, Infectious Diseases and Associated Ethical Impacts. *Philosophy & Technology, 32*(1), 69–85. https://doi.org/10.1007/s13347-017-0278-y

Golas, S. B., Shibahara, T., Agboola, S., Otaki, H., Sato, J., Nakae, T., Hisamitsu, T., Kojima, G., Felsted, J., Kakarmath, S., Kvedar, J., & Jethwani, K. (2018). A machine learning model to predict the risk of 30-day readmissions in patients with heart failure: a retrospective analysis of electronic medical records data. *BMC Medical Informatics and Decision Making, 18*(1), 44. https://doi.org/10.1186/s12911-018-0620-z

Goldman, K. D., & Schmalz, K. J. (2004). The Matrix Method of Literature Reviews. *Health Promotion Practice, 5*(1), 5–7. https://doi.org/10.1177/1524839903258885

Grossglauser, M., & Saner, H. (2014). Data-driven healthcare: from patterns to actions. *European Journal of Preventive Cardiology, 21*(2 Suppl), 14–17. https://doi.org/10.1177/2047487314552755

Hammad, R., Barhoush, M., & Abed-Alguni, B. H. (2020). A Semantic-Based Approach for Managing Healthcare Big Data: A Survey. *Journal of Healthcare Engineering, 2020*, 8865808. https://doi.org/10.1155/2020/8865808

Hulsen, T. (2022). Data Science in Healthcare: COVID-19 and Beyond. *International Journal of Environmental Research and Public Health, 19*(6). https://doi.org/10.3390/ijerph19063499

Jagadeeswari, V., Subramaniyaswamy, V., Logesh, R., & Vijayakumar, V. (2018). A study on medical Internet of Things and Big Data in personalized healthcare system. *Health Information Science and Systems, 6*(1), 14. https://doi.org/10.1007/s13755-018-0049-x

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: past, present and future. *Stroke and Vascular Neurology, 2*(4), 230–243. https://doi.org/10.1136/svn-2017-000101

Lemmen, C., Simic, D., & Stock, S. (2021). A Vision of Future Healthcare: Potential Opportunities and Risks of Systems Medicine from a Citizen and Patient Perspective-Results of a Qualitative Study. *International Journal of Environmental Research and Public Health, 18*(18). https://doi.org/10.3390/ijerph18189879

Majnarić, L. T., Babič, F., O'Sullivan, S., & Holzinger, A. (2021). AI and Big Data in Healthcare: Towards a More Comprehensive Research Framework for Multimorbidity. *Journal of Clinical Medicine, 10*(4). https://doi.org/10.3390/jcm10040766

Murphy, D. C., & Saleh, D. B. (2020). Artificial Intelligence in plastic surgery: What is it? Where are we now? What is on the horizon? *The Annals of The Royal College of Surgeons of England, 102*(8), 577–580. https://doi.org/10.1308/rcsann.2020.0158

Norori, N., Hu, Q., Aellen, F. M., Faraci, F. D., & Tzovara, A. (2021). Addressing bias in big data and AI for health care: A call for open science. *Patterns, 2*(10).

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Bmj, 372*, n71. https://doi.org/10.1136/bmj.n71

Raghupathi, W., & Raghupathi, V. (2014). Big data analytics in healthcare: promise and potential. *Health Information Science and Systems, 2*(1), 3. https://doi.org/10.1186/2047-2501-2-3

Ross, M. K., Wei, W., & Ohno-Machado, L. (2014). "Big data" and the electronic health record. *Yearbook of Medical Informatics, 9*(1), 97–104. https://doi.org/10.15265/iy-2014-0003

Tenali, N., & Babu, G. R. M. (2023). A Systematic Literature Review and Future Perspectives for Handling Big Data Analytics in COVID-19 Diagnosis. *New Generation Computing, 41*(2), 243–280. https://doi.org/10.1007/s00354-023-00211-8

Vaishya, R., Javaid, M., Khan, I. H., & Haleem, A. (2020). Artificial Intelligence (AI) applications for COVID-19 pandemic. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14*(4), 337–339. https://doi.org/10.1016/j.dsx.2020.04.012

Viceconti, M., Hunter, P., & Hose, R. (2015). Big data, big knowledge: big data for personalized healthcare. *IEEE Journal of Biomedical and Health Informatics, 19*(4), 1209–1215. https://doi.org/10.1109/jbhi.2015.2406883

Xiong, H., Chen, H., Xu, L., Liu, H., Fan, L., Tang, Q., & Cho, H. (2022). A survey of data element perspective: Application of artificial intelligence in health big data. *Frontiers in Neuroscience, 16*, 1031732. https://doi.org/10.3389/fnins.2022.1031732

Yang, J., Soltan, A. A. S., Eyre, D. W., & Clifton, D. A. (2023). Algorithmic fairness and bias mitigation for clinical machine learning with deep reinforcement learning. *nature machine intelligence, 5*(8), 884–894. https://doi.org/10.1038/s42256-023-00697-3

Yang, J., Soltan, A. A. S., Eyre, D. W., Yang, Y., & Clifton, D. A. (2023). An adversarial training framework for mitigating algorithmic biases in clinical machine learning. *npj digital medicine, 6(*1), 55. https://doi.org/10.1038/s41746-023-00805-y

Zhou, N., Corsini, E. M., Jin, S., Barbosa, G. R., Kell, T., Antonoff, M. H., & Antonoff, M. B. (2020). Advanced Data Analytics for Clinical Research Part I: What are the Tools? *Innovations: Technology and Techniques in Cardiothoracic and Vascular Surgery, 15*(2), 114–119. https://doi.org/10.1177/1556984520902783

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From Knowledge to Practice: Assessing Adolescent Learners' Nutrition Literacy and Its Determinants in South African Schools

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Abstract

Adolescence is a critical period for establishing lifelong dietary habits (World Health Organization, 2018). School-based Nutrition Education (NE) is a key strategy for improving nutritional knowledge. However, the effectiveness of such education in low- and middle-income countries like South Africa, with its persistent double burden of malnutrition, requires continuous evaluation. This study assessed the level and nature of nutrition knowledge among high school learners and explored its association with grade level, subject exposure, and food group awareness. A cross-sectional survey was conducted with 60 Grade 10–12 learners (50% male, 50% female) from three schools in the Thabo Mofutsanyane District, South Africa. Data were collected using a structured questionnaire, capturing familiarity with core nutritional concepts and exposure to NE. Descriptive statistics (frequencies, percentages, means, standard deviations) and chi-square tests were used for analysis, framed within the Knowledge component of the Knowledge-Attitude-Practice (KAP) model and the theory of planned behaviour. Learners demonstrated high familiarity with the benefits of fruits and vegetables (mean = 4.5 ± 0.7) and risks of excessive fat (mean = 4.2 ± 1.0), but significantly lower knowledge regarding the risks of high carbohydrate consumption (mean = 2.7 ± 1.4). While 83.3% reported receiving NE, exposure was highest in Grade 10 (35%) and primarily through Natural Science and Technology (45%) and Life Sciences (35%). Awareness was universal for fruits & vegetables (100%) but lower for carbohydrates (60%). Learners possess uneven nutrition literacy, with identifiable gaps in understanding macronutrients like carbohydrates. NE delivery is fragmented across subjects and grades. To bridge the knowledge-practice gap, a more structured, comprehensive, and contextually relevant NE curriculum, potentially with standalone status, is recommended to empower adolescents to make informed dietary choices.

Keywords: nutrition education, nutrition literacy, adolescents, knowledge-attitude-practice (KAP) model, TPB, South Africa, school health

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Introduction

Adolescence is a formative educational and developmental stage characterised by rapid physical growth, cognitive advancement, and the establishment of lifelong health behaviours. During this period, nutrition plays a pivotal role not only in physical wellbeing but also in learning capacity, school engagement, and long-term health trajectories (World Health Organization, 2018). From a curriculum design perspective, adolescence presents a critical opportunity for structured, developmentally appropriate nutrition education that can equip learners with the knowledge and competencies necessary to make informed dietary choices.

In South Africa, adolescent nutrition occurs within a complex epidemiological and educational landscape. Persistent undernutrition and micronutrient deficiencies coexist with increasing rates of overweight and obesity, reflecting the "double burden of malnutrition" (Sedibe et al., 2018; Shisana et al., 2013). Addressing this dual challenge requires more than health sector interventions alone; it demands coherent and effective curriculum design that integrates nutrition literacy as a foundational life skill within schooling.

Globally, school-based nutrition education is recognised as a key curricular strategy for enhancing nutrition knowledge, shaping positive health attitudes, and supporting healthy dietary practices among young people (Contento, 2011; Dudley et al., 2015). In South Africa, however, nutrition education is not formalised as a standalone subject. Instead, it is dispersed across multiple subjects—Life Orientation, Natural Sciences and Technology, and Life Sciences—within the Curriculum and Assessment Policy Statement (CAPS) framework (Department of Basic Education, 2011). Complementing this curricular approach, the National School Nutrition Programme (NSNP) seeks to link school feeding with nutrition education to improve both learner health and educational outcomes (Kupolati et al., 2015).

Despite these curriculum and policy commitments, concerns persist regarding the coherence, depth, and pedagogical effectiveness of the integrated nutrition education model. Diffusion of nutrition content across subjects may result in fragmented coverage, limited progression across grades, and inconsistent emphasis, depending on subject priorities and teacher expertise. Furthermore, educators responsible for delivering nutrition-related content often lack specialised training in nutrition science, raising questions about curricular fidelity, accuracy, and learner engagement (Nguyen et al., 2017; Ronto et al., 2017). These challenges highlight the need for empirical evidence to inform curriculum review and development processes.

The Knowledge–Attitude–Practice (KAP) model provides a useful conceptual lens for examining curriculum effectiveness, particularly in health education. The model posits that knowledge acquisition forms the foundation upon which attitudes are shaped and behaviours adopted (Launiala, 2009). From a curriculum development standpoint, assessing learners' nutrition knowledge is therefore a critical first step in evaluating whether existing curricular intentions translate into meaningful educational outcomes. While prior research has focused largely on teachers' experiences of delivering nutrition education, there remains limited, context-specific evidence on learner-level nutrition knowledge in South African secondary schools.

This study is guided by the Theory of Planned Behaviour (TPB) proposed by Ajzen (1991), which provides a robust framework for understanding the relationship between knowledge and behaviour. The TPB posits that an individual's behaviour is primarily determined by their

behavioural intention, which in turn is influenced by three key constructs: attitudes, subjective norms, and perceived behavioural control.

In the context of adolescent nutrition, attitudes refer to learners' beliefs about healthy eating and the perceived benefits or disadvantages of consuming nutritious foods. Positive attitudes towards healthy diets are expected to increase the likelihood of forming intentions to adopt healthy eating behaviours. Subjective norms capture the perceived social pressures from peers, family members, teachers, and the broader school environment that influence adolescents' dietary choices. In school settings, social influences are particularly important as adolescents are highly responsive to peer behaviours and expectations.

Perceived behavioural control (PBC) reflects learners' perceived ability to make healthy food choices, considering factors such as accessibility, affordability of nutritious foods, and self-efficacy. In the South African context, structural constraints—including school food environments and socio-economic conditions—may significantly shape this construct. According to TPB, PBC not only influences behavioural intention but can also directly affect actual behaviour.

While TPB does not explicitly incorporate knowledge, this study integrates nutrition literacy as a foundational determinant that shapes the core constructs of the theory. Nutrition literacy is conceptualised as adolescents' ability to obtain, understand, and apply nutrition information to make informed dietary decisions. Higher levels of nutrition literacy are expected to promote more favourable attitudes towards healthy eating, strengthen perceived behavioural control, and positively influence behavioural intentions.

Thus, within this study, nutrition literacy operates as an upstream predictor, influencing attitudes, subjective norms, and perceived behavioural control, which subsequently shape behavioural intentions and ultimately dietary practices. This framework enables a comprehensive analysis of how knowledge translates into practice among adolescent learners.

By applying TPB in the South African school context, this study provides insights into both individual-level cognitive determinants and broader social and environmental influences that affect adolescents' nutrition behaviours. The framework therefore supports the identification of key intervention points for improving dietary practices among learners.

Against this backdrop, this study aimed to assess the nutrition literacy of adolescent learners in a selected district of the Free State Province, South Africa, with specific reference to curriculum exposure and learning outcomes. The objectives were to:

1. Determine the level and nature of nutrition knowledge among a sample of high school learners; and
2. Examine associations between nutrition knowledge, grade level, subject-based exposure to nutrition content, and awareness of food groups.

By generating learner-centred evidence, the study seeks to contribute to ongoing debates on curriculum design, sequencing, and development of more coherent and responsive nutrition education within the secondary school curriculum.

Methods

Study Design and Setting

The study employed a quantitative, descriptive cross-sectional survey design to examine learner-related factors relevant to the design, development, and implementation of the Life Sciences curriculum at secondary school level. This design was appropriate for capturing learners' perspectives at a single point in time, thereby generating empirical evidence that can inform curriculum review, alignment, and improvement within the Further Education and Training (FET) phase.

The research was conducted in three public secondary schools located in the Nketoana Municipality, Thabo Mofutsanyane District, Free State Province, South Africa. These schools operate within predominantly rural and semi-rural contexts, where curriculum design decisions, resource availability, and pedagogical practices have a direct impact on learner engagement and curriculum effectiveness. The setting therefore offered a relevant context for investigating curriculum-related issues within authentic schooling environments.

Population and Sampling

The target population consisted of adolescent learners enrolled in Grades 10–12 and registered for Life Sciences, a core subject within the FET curriculum that plays a critical role in scientific literacy, knowledge progression, and skills development. Learners in these grades were considered suitable participants, as they engage with increasingly complex curriculum content and assessment demands, making their experiences valuable for informing curriculum design and development.

A purposive sampling technique was used to select three secondary schools offering Life Sciences. This approach enabled the inclusion of diverse learner perspectives that are essential for understanding how curriculum content and structure are experienced by different learner groups. The total sample comprised 60 learners, all aged between 16 and 18 years. While the findings are not intended for statistical generalisation, the sample provided contextually grounded data that contribute to discussions on curriculum responsiveness, learner-centred design, and evidence-informed curriculum development in secondary education.

Data Collection Instrument

Data were collected using a pre-tested, structured, self-administered questionnaire designed to generate information relevant to curriculum content exposure, knowledge alignment, and learner understanding within the Life Sciences and related school subjects. The instrument was reviewed for clarity and content relevance prior to administration to ensure its suitability for the target age group and educational context.

The questionnaire consisted of two sections.

Section A: Socio-Demographic Information

This section collected background information on participants, including grade level and gender, to support the analysis of curriculum exposure and knowledge development across different learner groups and stages of the Further Education and Training (FET) phase.

Section B: Nutrition Knowledge and Curriculum Exposure

This section assessed learners' nutrition-related knowledge and exposure to nutrition education (NE) within the school curriculum. A five-point Likert scale (1 = Not Familiar to 5 = Extremely Familiar) was used to measure learners' familiarity with five key nutrition concepts commonly addressed or implied within Life Sciences and related subjects (e.g., the importance of a healthy diet, and the health risks associated with excessive carbohydrate intake).

In addition, Section B included closed-ended questions that assessed learners' exposure to nutrition education within the formal curriculum (yes/no/not sure), the grade level and subject in which nutrition-related content was received, and learners' awareness of basic food groups, measured using a checklist format. These items were included to determine how nutrition concepts are distributed across grades and subjects and to assess the extent to which curriculum design supports progressive knowledge development.

Overall, the data collection instrument was structured to capture information that informs discussions on curriculum coherence, content integration, and the alignment of health-related knowledge within secondary school curricula, thereby contributing to evidence-based curriculum design and development.

Data Analysis

Collected data were systematically cleaned, coded, and captured using Microsoft Excel, and subsequently analysed using JASP statistical software (Version 0.18.3). The analysis focused on generating insights relevant to curriculum content exposure, knowledge acquisition, and progression across grade levels.

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were computed to summarise learners' demographic characteristics, levels of nutrition knowledge, and exposure to nutrition-related curriculum content. These statistics provided an overview of how key nutrition concepts are understood and experienced by learners within the secondary school curriculum.

To examine potential relationships between curriculum-related variables, chi-square tests of association were conducted. These tests explored associations between categorical variables, such as grade level and specific nutrition knowledge items, to determine whether curriculum exposure and knowledge differed across grades. Such analyses were used to identify patterns that may inform curriculum sequencing, coherence, and development within the Life Sciences curriculum and related subjects.

Findings were presented in tabular form to enhance clarity and support interpretation. The analysis was conceptually guided by the "Knowledge" construct of the Knowledge–Attitudes–Practices (KAP) model, which emphasises knowledge acquisition as a foundational element in curriculum design and learner development. This framework supported the interpretation of results in relation to curriculum effectiveness and content alignment.

Ethical Considerations

Ethical approval for the study was obtained from the University of the Free State General/Human Research Ethics Committee (Reference: UFS HSD2023/2584) and the

Provincial Department of Education. Institutional permission to conduct the study was granted by the principals of the participating schools.

Given the involvement of minors, strict ethical procedures were followed. Written informed consent was obtained from parents or legal guardians, and assent was obtained from all learner participants prior to data collection. Participation in the study was voluntary, and learners were informed of their right to withdraw at any stage without penalty.

To uphold ethical standards in educational research and curriculum-focused inquiry, anonymity and confidentiality were maintained throughout the study. No identifying information was collected, and all data were securely stored and used solely for academic and research purposes. These measures ensured compliance with ethical principles relevant to school-based research and safeguarded the rights and well-being of all participants.

Results

Sample Characteristics

The study sample consisted of 60 secondary school learners, with an equal gender distribution comprising 30 males (50%) and 30 females (50%). This balanced representation supports meaningful interpretation of learner experiences related to curriculum exposure across gender groups.

Participants were drawn from Grades 10 to 12, reflecting the full range of the Further Education and Training (FET) phase in which Life Sciences content is progressively developed. Of the total sample, 21 learners (35%) were enrolled in Grade 10, 19 learners (31.7%) in Grade 11, and 20 learners (33.3%) in Grade 12.

The relatively even distribution across grade levels allowed for comparative analysis of learners' knowledge and exposure to curriculum content across different stages of secondary education, thereby supporting examination of curriculum progression and sequencing within the Life Sciences subject.

Level and Nature of Nutrition Knowledge

Table 1 presents learners' self-reported familiarity with selected core nutrition concepts, reflecting areas of knowledge emphasised or under-emphasised within the school curriculum. The overall mean familiarity score across all nutrition items was 3.8, indicating a moderate level of nutrition knowledge among learners in the Further Education and Training (FET) phase.

Marked variation was observed across individual nutrition concepts. Learners reported the highest levels of familiarity with the benefits of including fruits and vegetables in the diet (mean = 4.5; SD = 0.7), with the majority indicating that they were either extremely or moderately familiar with this concept. Similarly, a high level of familiarity was reported for the risks associated with excessive fat intake (mean = 4.2; SD = 1.0).

In contrast, familiarity with the risks of including too many carbohydrates in the diet was substantially lower (mean = 2.7; SD = 1.4). One quarter of the learners (25%) reported that they were not familiar with this concept, while an additional 20% indicated that they were only

slightly familiar. This pattern suggests uneven knowledge distribution across nutrition topics presented within or alongside the formal curriculum.

Moderate familiarity levels were reported for the importance of a healthy diet (mean = 3.8; SD = 1.0) and healthy foods to be eaten daily (mean = 3.9; SD = 1.3). Collectively, these findings provide descriptive evidence of learners' nutrition knowledge profiles and highlight variation in familiarity with specific concepts relevant to curriculum content and emphasis.

Table 1
Learners' Familiarity With Issues Related to Nutrition (N = 60)

Nutrition Issue	Extremely Familiar n (%)	Moderately Familiar n (%)	Somewhat Familiar n (%)	Slightly Familiar n (%)	Not Familiar n (%)	Mean (SD)
Importance of a healthy diet	15 (25.0)	24 (40.0)	16 (26.7)	2 (3.3)	3 (5.0)	3.8 (1.0)
Healthy foods to be eaten daily	31 (51.7)	9 (15.0)	13 (21.7)	1 (1.7)	6 (10.0)	3.9 (1.3)
Risks of too many carbohydrates	10 (16.7)	11 (18.3)	11 (18.3)	12 (20.0)	15 (25.0)	2.7 (1.4)
Risks of too much fat	35 (58.3)	13 (21.7)	6 (10.0)	6 (10.0)	0 (0.0)	4.2 (1.0)
Benefits of fruits and vegetables	39 (65.0)	13 (21.7)	5 (8.3)	2 (3.3)	1 (1.7)	4.5 (0.7)

Exposure to Nutrition Education and Food Group Awareness

Table 2 summarises learners' self-reported exposure to nutrition education (NE) within the formal school curriculum and their awareness of basic food groups. The majority of learners (83.3%) indicated that they had been exposed to nutrition-related content at some point during their schooling.

Reported NE exposure was highest in Grade 10 (35.0%) and lowest in Grade 11 (8.3%). Notably, no Grade 12 learners reported recent exposure to nutrition education. With regard to subject placement, nutrition-related content was most frequently reported in Natural Science and Technology (45.0%), followed by Life Sciences (35.0%), indicating that nutrition education was distributed across subjects rather than consistently embedded in a single curriculum area.

Learners' awareness of food groups varied across categories. Awareness was highest for Fruits and Vegetables (100%) and Fats (78.3%), while awareness of Carbohydrates was comparatively lower (60.0%). This pattern mirrors disparities observed in reported familiarity with specific nutrition concepts.

A chi-square test of association revealed a statistically significant relationship between the grade level at which nutrition education was received and awareness of carbohydrates (χ^2 =

12.85, p = 0.012). Learners who reported receiving nutrition education in earlier grades demonstrated higher awareness of carbohydrates compared to those exposed in later grades. No statistically significant associations were observed for other food groups.

These findings provide descriptive evidence of variation in curriculum exposure and content emphasis across grades and subjects, highlighting differences in learner awareness that are relevant to curriculum sequencing and content integration.

Table 2
Learners' Exposure to School Nutrition Education (N = 60)

Variable	Category	n (%)
Learnt about Nutrition	Yes	50 (83.3)
	No	0 (0.0)
	Not Sure	10 (16.7)
Grade NE was Taught	Grade 8	15 (25.0)
	Grade 9	19 (31.7)
	Grade 10	21 (35.0)
	Grade 11	5 (8.3)
	Grade 12	0 (0.0)
Subject Teaching NE	Life Sciences	21 (35.0)
	Natural Science & Tech	27 (45.0)
	Life Orientation	12 (20.0)
Food Group Awareness	Carbohydrates	36 (60.0)
	Fruits & Vegetables	60 (100.0)
	Proteins	45 (75.0)
	Fats	47 (78.3)
	Dairy Products	39 (65.0)

Discussion

This study offers insight into adolescents' nutrition literacy within a South African school district and, when viewed through the lens of curriculum design and development, reveals important strengths and critical structural gaps in the current Nutrition Education (NE) curriculum. Learners demonstrated strong awareness of the benefits of fruit and vegetable consumption and the health risks associated with excessive fat intake. This pattern reflects the dominant focus of global and national public health campaigns, which have consistently prioritised plant-based foods and framed dietary fat as harmful (Temme et al., 2020). From a curriculum perspective, this suggests that certain nutrition messages are effectively transmitted; however, they may be overemphasised at the expense of a balanced and conceptually integrated understanding of nutrition.

In contrast, the notably low awareness of the risks of excessive carbohydrate intake highlights a significant curricular omission. This is particularly concerning in a context where staple diets are predominantly carbohydrate-based and where adolescent overweight and obesity are rising (Sedibe et al., 2018; Shisana et al., 2013). The findings suggest that the existing curriculum may insufficiently address macronutrient complexity, including distinctions between carbohydrate types, quality, and appropriate consumption levels. Rather than supporting conceptual understanding, current curriculum content may inadvertently foster oversimplified

or misleading narratives, such as the perception that carbohydrates are either inherently unhealthy or unproblematic, depending on exposure.

The concentration of NE exposure in Grade 10, with limited continuation in subsequent grades, points to a fragmented and episodic curriculum structure rather than a deliberately sequenced learning progression. Effective curriculum design literature advocates for spiral or vertical articulation, where core concepts are revisited with increasing depth and cognitive demand over time (Kyere et al., 2020). The absence of such progression in NE suggests that curriculum development has prioritised content inclusion over conceptual continuity, reducing opportunities for consolidation and transfer of knowledge into practice.

Furthermore, the allocation of NE content across three subjects, without a clearly designated curricular home, raises concerns regarding coherence and curriculum ownership. When accountability for key content is dispersed, messaging may become inconsistent and superficial, as reported in earlier South African studies (Nguyen et al., 2017; Ronto et al., 2017). From a curriculum design standpoint, this fragmentation risks diluting both depth and pedagogical intent, undermining learners' ability to construct an integrated understanding of nutrition. The observed association between earlier-grade exposure and improved carbohydrate awareness reinforces the educational value of early introduction paired with systematic reinforcement, rather than isolated content delivery.

The stark contrast between universal awareness of fruits and vegetables and limited understanding of carbohydrates also suggests a curriculum bias toward food-based messaging instead of systems-based nutrition literacy. Within the Knowledge–Attitude–Practice (KAP) framework, incomplete or imbalanced knowledge constrains the development of informed attitudes and sustainable dietary behaviours (Launiala, 2009). Curriculum design that prioritises slogans or singular food groups over conceptual models of balance and moderation may therefore weaken the foundation needed for behaviour change.

Insights from the broader qualitative component of the study further emphasise that curriculum reform must be contextually responsive. Learners reported that even when nutritional knowledge is present, structural barriers—such as household poverty, limited food availability, and the dominance of low-cost, carbohydrate-dense convenience foods—significantly limit the translation of knowledge into practice (Steyn et al., 2011). This underscores the need for curriculum development that integrates nutrition knowledge with critical food literacy, socio-economic awareness, and problem-solving skills relevant to learners' lived realities.

Taken together, these findings suggest that strengthening adolescent nutrition literacy requires more than expanded content coverage. It calls for intentional curriculum redesign that ensures coherence, progression, and conceptual balance across grades, alongside pedagogies that acknowledge environmental constraints. Aligning NE with principles of effective curriculum design may enhance not only learner understanding but also the relevance and applicability of nutrition education in complex, resource-constrained settings.

Limitations

The study is limited by its relatively small, purposively selected sample drawn from a single district, which restricts the generalisability of findings. Reliance on self-reported data introduces potential recall and social desirability bias. Additionally, the cross-sectional design precludes conclusions about causality. Despite these limitations, the findings offer valuable

curriculum-relevant insights that can inform future health education curriculum design and development.

Conclusions and Recommendations

This study concludes that although South African adolescents in this sample have been exposed to Nutrition Education (NE) and demonstrate knowledge in select areas, their overall nutrition literacy remains uneven, partial, and insufficiently developed. A particularly concerning deficit was identified in learners' understanding of carbohydrates, a core macronutrient central to both dietary balance and the epidemiology of non-communicable diseases in South Africa. From a curriculum design perspective, NE delivery appears fragmented, temporally compressed into early high school years, and lacking a coherent, developmental structure that supports cumulative learning.

These findings suggest that the current NE curriculum prioritises content coverage over curricular coherence, conceptual progression, and reinforcement, limiting its capacity to build robust and transferable nutrition literacy. As a result, learners may acquire isolated facts rather than an integrated understanding of nutrition that can meaningfully inform attitudes and practices, as conceptualised in the Knowledge–Attitude–Practice (KAP) model.

To strengthen the "Knowledge" pillar of the KAP model through improved curriculum design and development, the following recommendations are proposed.

1. Curriculum Review and Redesign

The Department of Basic Education should undertake a systematic review of the Curriculum and Assessment Policy Statement (CAPS) with the aim of establishing a structured, sequential, and developmentally appropriate NE framework. This may involve:

- Clearly designating standardised NE modules across relevant subjects with explicit learning outcomes and conceptual links; or
- Exploring the feasibility of a standalone, credit-bearing health and nutrition subject in the senior secondary phase.

Such reforms would support curriculum coherence, reduce content fragmentation, and enable the implementation of a spiral curriculum approach in which key nutrition concepts—such as macronutrient balance—are revisited with increasing depth and contextual relevance.

2. Teacher Capacity Building

Effective curriculum implementation is dependent on teacher confidence and content knowledge. Targeted, ongoing professional development is therefore essential to equip teachers with comprehensive nutrition science knowledge, including nuanced macronutrient education, as well as pedagogical strategies that contextualise nutrition within learners' socio-economic and food environments. Strengthening teacher capacity would enhance curriculum fidelity and reduce inconsistencies in NE delivery across subjects and grades.

3. Targeted and Contextually Relevant Learner Resources

There is a clear need for the development of engaging, age-appropriate, and culturally relevant learning materials that directly address identified knowledge gaps. Particular attention should

be given to complex and under-taught areas such as carbohydrate quality, portion sizes, and diet–disease relationships. Curriculum-aligned resources that incorporate real-life food environments, affordability constraints, and critical food literacy may improve both learner engagement and conceptual understanding.

Future Research

Future studies should employ larger, nationally representative samples and longitudinal designs to assess the retention of nutrition knowledge and its translation into attitudes and behaviours over time. Further investigation is also needed into the interaction between curriculum content, learner knowledge, and external determinants such as household food security and the local food environment. Such evidence would be invaluable in informing responsive, context-sensitive curriculum development in nutrition education.

Author Contributions

BPM: Conceptualization (original study), Methodology, Investigation, Data Curation. VO: Writing – Original Draft, Project administration. VO: Conceptualization (manuscript structure), Formal Analysis structuring, Writing – Original Draft, Writing – Review & Editing.

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Declaration of Competing Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Contento, I. R. (2011). *Nutrition education: Linking research, theory, and practice* (2nd ed.). Jones & Bartlett Learning.

Department of Basic Education. (2011). *Curriculum and Assessment Policy Statement (CAPS): Life Sciences Grades 10–12*. https://www.education.gov.za/Portals/0/CD/National%20Curriculum%20Statements%20and%20Vocational/CAPS%20FET%20_%20LIFE%20SCIENCES%20_%20GR%2010-12%20Web_2636.pdf

Dudley, D. A., Cotton, W. G., & Peralta, L. R. (2015). Teaching approaches and strategies that promote healthy eating in primary school children: A systematic review and meta-analysis. International *Journal of Behavioral Nutrition and Physical Activity, 12*, Article 28. https://doi.org/10.1186/s12966-015-0182-8

Kupolati, M. D., MacIntyre, U. E., Gericke, G. J., & Becker, P. (2019). A Contextual Nutrition Education Program Improves Nutrition Knowledge and Attitudes of South African Teachers and Learners. *Frontiers in Public Health,* 7. https://doi.org/10.3389/fpubh.2019.00258

Kyere, P., Veerman, J. L., Lee, P., & Stewart, D. E. (2020). Effectiveness of school-based nutrition interventions in sub-Saharan Africa: A systematic review. *Public Health Nutrition, 23*(14), 2626–2636. https://doi.org/10.1017/S1368980020000506

Launiala, A. (2009). How much can a KAP survey tell us about people's knowledge, attitudes and practices? Some observations from medical anthropology research on malaria in pregnancy in Malawi. *Anthropology Matters, 11*(1), 1–13. https://doi.org/10.22582/am.v11i1.31

Nguyen, K. A., De Villiers, A., Fourie, J. M., & Hendricks, M. (2017). Challenges to implementing the food-based dietary guidelines in the South African primary school curriculum: A qualitative study. *South African Journal of Clinical Nutrition, 30*(1), 15–20. https://doi.org/10.1080/16070658.2016.1230971

Ronto, R., Ball, L., Pendergast, D., & Harris, N. (2017). What is the status of food literacy in Australian high schools? Perceptions of home economics teachers. *Appetite, 108*, 326–334. https://doi.org/10.1016/j.appet.2016.10.024

Sedibe, M. H., Pisa, P. T., Feeley, A. B., Pedro, T. M., Kahn, K., & Norris, S. A. (2018). Dietary habits and eating practices and their association with overweight and obesity in rural and urban Black South African adolescents. *Nutrients, 10*(2), 145. https://doi.org/10.3390/nu10020145

Shisana, O., Labadarios, D., Rehle, T., Simbayi, L., Zuma, K., Dhansay, A., Reddy, P., Parker, W., Hoosain, E., Naidoo, P., Hongoro, C., Mchiza, Z., Steyn, N. P., Dwane, N., Makoae, M., Maluleke, T., Ramlagan, S., Zungu, N., Evans, M. G., Jacobs, L., Faber, M., & SANHANES-1 Team. (2013). *South African National Health and Nutrition Examination Survey (SANHANES-1)*. HSRC Press.

Steyn, N. P., Labadarios, D., Nel, J. H., & Maunder, E. (2011). Factors which influence the consumption of street foods and fast foods in South Africa—a national survey. *Nutrition Journal, 10*, Article 104. https://doi.org/10.1186/1475-2891-10-104

Temme, E. H. M., Vellinga, R. E., de Ruiter, H., Kugelberg, S., van de Kamp, M., Milford, A. B., Alessandrini, R., Bartolini, F., Sanz-Cobena, A., & Leip, A. (2020). Demand-side food policies for public and planetary health. *Sustainability, 12*(15), Article 5924. https://doi.org/10.3390/su12155924

World Health Organization, & Food and Agriculture Organization of the United Nations. (2018). *The nutrition challenge: Food system solutions*. World Health Organization. https://www.who.int/publications/i/item/WHO-NMH-NHD-18-10

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AI-Mediated Feedback in Education: Teachers' Baseline Perceptions, Opportunities, and Professional Barriers in a Research-Action Context

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Abstract

The integration of Artificial Intelligence (AI) in education is progressively reshaping feedback processes, shifting them from episodic corrective acts to continuous, data-informed, and dialogic mechanisms embedded within learning environments. Building on the Conversational Framework and feedback literacy literature, this study investigates teachers' baseline perceptions of AI-mediated feedback within a research-action professional development pathway. The dataset includes 363 teachers who completed a structured questionnaire grounded in the distinction between beliefs, perceived opportunities, and perceived barriers related to feedback and AI. Descriptive and inferential analyses were conducted; Results show a pre-existing culture of formative feedback. Perceived opportunities of AI for feedback are moderately high particularly in relation to learning analytics and immediate feedback, while perceived effectiveness is evaluated more cautiously. Notably, the need for professional training emerges as a dominant barrier, whereas ethical-normative concerns appear as a distinct and non-overlapping dimension. Innovative findings indicate that teachers do not display technophobic resistance; rather, they adopt a posture of reflective professional caution. Cluster analysis identifies a majority profile of "open but cautious" teachers who recognise AI's feedback potential but remain uncertain about its pedagogical effectiveness. The findings further reveal a distinction between perceived technological capability and educational legitimacy, suggesting that teachers evaluate as a pedagogical actor. These results indicate that the integration of AI into feedback practices is mediated more by professional agency and pedagogical judgement than by technological access alone. Feedback therefore emerges as a privileged lens through which teachers negotiate the educational legitimacy of AI.

Keywords: mediated feedback, AI literacy, professional agency

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Introduction

Artificial Intelligence (AI) is no longer an emerging technology awaiting adoption in education. It is increasingly becoming part of everyday teaching practices, reshaping how teachers design learning activities, monitor students' progress, and provide instructional support. Recent advances in generative AI and learning analytics have expanded the capacity of digital systems to generate personalised explanations, monitor learning trajectories, and deliver immediate feedback, prompting renewed debate about the evolving relationship between technology and pedagogy.

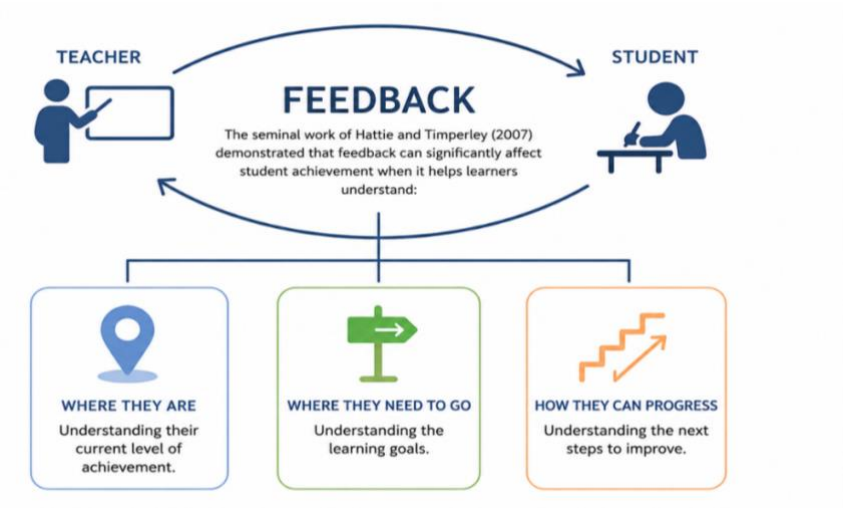
Within this debate, feedback represents one of the first educational practices to be substantially transformed by AI. Unlike traditional assessment, which often relies on delayed and teacher-centred interactions, AI-mediated environments enable continuous, adaptive, and data-informed feedback capable of supporting learning throughout the educational process. Consequently, feedback is no longer conceived as a final corrective act but as an ongoing mechanism of learning regulation embedded within increasingly dialogic learning environments. This transformation is particularly relevant from a pedagogical perspective. Feedback has long been recognised as one of the most influential factors affecting learning (Hattie & Timperley, 2007; Shute, 2008), while the Conversational Framework (Laurillard, 2012) conceptualises feedback as the mechanism that sustains iterative cycles of dialogue, reflection, and conceptual change between teachers and learners. More recently, the concept of feedback literacy has further emphasised that the educational value of feedback depends not only on the quality of information provided but also on teachers' and learners' capacity to interpret, evaluate, and use that information effectively (Carless & Boud, 2018). These perspectives suggest that the integration of AI into feedback cannot be understood solely as a technological innovation but must also be examined as a transformation of pedagogical practice. Although a growing body of research has investigated teachers' attitudes towards AI, technology acceptance, and ethical concerns, considerably less attention has been devoted to understanding how teachers interpret AI when it becomes embedded within feedback practices. Existing studies frequently examine AI adoption as a technological issue, whereas the pedagogical conditions through which teachers attribute educational value to AI-generated feedback remain underexplored. This distinction is particularly important because recognising the technical capabilities of AI does not necessarily imply recognising its pedagogical legitimacy. Against this background, the present study investigates teachers' baseline perceptions of AI-mediated feedback within a national research-action professional development pathway involving 363 Italian teachers from different educational levels. Rather than examining technology adoption per se, the study explores how teachers evaluate the opportunities, effectiveness, and barriers associated with AI-supported feedback before participating in structured professional development. By combining descriptive and inferential analyses with exploratory factor and cluster analyses, the study aims to contribute to the growing literature on AI in Education by shifting the focus from technological adoption to pedagogical judgement. It argues that teachers negotiate the educational legitimacy of AI primarily through feedback practices and that professional agency and feedback literacy play a more decisive role than technological access alone in shaping AI integration within formative assessment.

Literature Review

Feedback has long been identified as a major influence on learning, although its effects depend on the form it takes, the level at which it operates, and the learner's capacity to use it. Hattie

and Timperley (2007) conceptualise feedback as information concerning aspects of a learner's performance or understanding. Its formative value lies in its capacity to reduce the distance between current performance and desired learning goals by addressing three interrelated questions: Where am I going? How am I going? Where to next? Feedback is therefore not intrinsically effective; it becomes educationally meaningful when it supports learners in interpreting goals, monitoring progress, and identifying subsequent actions.

Figure 1
Information Feedback Hittie and Timperly (2007)



Similarly, Shute (2008) defines formative feedback as information intended to modify learners' thinking or behaviour in ways that improve learning. This perspective shifts attention from the simple provision of comments to their potential effects on cognitive and metacognitive regulation. Timeliness, specificity, clarity, and alignment with the learning task influence whether feedback supports improvement or generates confusion, dependency, or cognitive overload. Feedback should consequently be understood not as an isolated message transmitted after performance, but as an intervention situated within a broader learning process. This process-oriented interpretation is central to Laurillard's (2012) Conversational Framework. In the framework, learning develops through iterative interactions between teachers, learners, peers, concepts, and practice environments. Learners act, receive information about the consequences of their actions, reflect on discrepancies, and revise both their conceptual understanding and subsequent performance. Feedback sustains this recursive movement between conceptual and practical levels. It is therefore embedded throughout the learning cycle rather than confined to assessment at its conclusion. From this perspective, digital technologies can expand the frequency and forms of feedback, but they do not automatically improve its educational quality. Their value depends on how feedback is incorporated into designed cycles of action, interpretation, reflection, and revision. This distinction is particularly important for Artificial Intelligence, whose capacity to generate immediate responses may increase the quantity and speed of feedback without necessarily ensuring its pedagogical appropriateness.

Contemporary feedback research has progressively moved beyond transmission models in which teachers provide information and students receive it. Learners are increasingly regarded as active participants who must interpret feedback, evaluate its relevance, manage emotional responses, and use it to improve future work. Carless and Boud (2018) describe feedback literacy as the understandings, capacities, and dispositions required to make sense of information and use it to enhance learning strategies or performance. Feedback literacy

includes appreciating the purpose of feedback, making evaluative judgements, managing affect, and taking action. Its introduction has important consequences for the study of AI-mediated feedback. The availability of rapid or personalised information does not guarantee that learners will understand, trust, or productively use it. Automated feedback may appear clear and authoritative while containing inaccuracies, oversimplifications, or recommendations that are insufficiently sensitive to learning goals and individual contexts. Students therefore need to compare outputs, recognise limitations, and decide how to act upon them. Feedback literacy also has a teacher dimension. Teachers must design processes that enable learners to engage with feedback, while critically evaluating the quality and appropriateness of the information generated by technological systems. Teacher feedback literacy involves pedagogical knowledge, evaluative expertise, relational sensitivity, and the capacity to create conditions in which feedback produces meaningful learner action (Carless & Winstone, 2023). In AI-supported environments, it additionally requires teachers to understand how automated outputs are produced, identify their possible limitations, and determine when they should be accepted, adapted, supplemented, or rejected. Consequently, AI-mediated feedback cannot be interpreted as the substitution of teacher feedback with automated information. It is better understood as a reconfiguration of feedback roles. AI may generate preliminary explanations, detect patterns, suggest revisions, or support the monitoring of learner progress. Teachers, however, remain responsible for relating such information to curricular intentions, disciplinary standards, student needs, classroom relationships, and the broader purposes of education. The development of learning analytics, adaptive systems, and generative AI has increased the possibility of providing feedback at a scale and speed that are difficult to achieve through teacher intervention alone. AI systems may support immediate responses, identify recurring errors, personalise explanations, and make patterns in student performance more visible. These functions are especially relevant in formative assessment, where the timely identification of learning needs can inform subsequent teaching and learning actions. Recent literature nevertheless presents a more complex picture than a straightforward narrative of technological improvement. AI-generated feedback may be valued for its accessibility, immediacy, and capacity to offer repeated support. At the same time, its effectiveness varies according to the task, disciplinary domain, quality of prompts, characteristics of the system, and learners' ability to evaluate its outputs. Automated systems may address easily identifiable or surface-level features more successfully than conceptual ambiguity, originality, relational factors, or the contextual meaning of student performance. The distinction between technical performance and educational value is therefore essential. An AI system may generate fluent, detailed, and immediate feedback while failing to support the intended learning process. It may provide a plausible correction without identifying the learner's underlying misconception or suggest an improved product without encouraging the learner to understand the reasoning required to produce it. Increased automation may also reduce opportunities for dialogue when feedback is treated as a completed output rather than as the beginning of further interpretation and action. International guidance consequently stresses that AI should support rather than displace human responsibility in education. Human-centred approaches emphasise transparency, inclusion, data protection, pedagogical appropriateness, and the continued responsibility of teachers and institutions for educational decisions (UNESCO, 2023). These principles suggest that the central issue is not simply whether AI can provide feedback, but under which pedagogical, professional, and ethical conditions its feedback can become educationally legitimate. The integration of AI into feedback practices raises questions about teachers' professional agency. From an ecological perspective, agency is not a fixed attribute possessed by an individual teacher but an achievement emerging from the interaction between professional capacities, past experiences, future orientations, cultural expectations, institutional structures, and available resources (Priestley et al., 2015). Teachers exercise agency when they make intentional and

context-sensitive choices within the opportunities and constraints of their working environments. In AI-mediated learning environments, professional agency concerns teachers' capacity to evaluate, interpret, and pedagogically mediate AI outputs while retaining responsibility for educational decisions. It does not imply rejecting automation or preserving exclusive human control over every instructional action. Rather, it involves determining which functions can appropriately be supported by AI, which require professional intervention, and how technological outputs should be integrated into meaningful learning processes. This interpretation helps distinguish technological capability from educational legitimacy. Technological capability refers to what an AI system appears able to perform, such as generating explanations, analysing data, or producing immediate responses. Educational legitimacy concerns whether and how those capabilities should be used in relation to particular learners, goals, contexts, and educational values. The latter cannot be established through technical performance alone because it requires pedagogical judgement. Much research on teachers and AI has focused on adoption intentions, perceived usefulness, ease of use, confidence, ethical concerns, or frequency of use. These dimensions are important, but they do not fully explain how teachers judge AI when it enters a pedagogically significant practice. A teacher may recognise the usefulness of immediate automated responses while remaining uncertain about their reliability, relational adequacy, or contribution to learning. Such caution should not automatically be interpreted as resistance to innovation. It may instead represent an exercise of professional judgement. The present study addresses this gap by examining teachers' baseline perceptions of AI-mediated feedback through the interconnected dimensions of feedback beliefs, perceived opportunities, perceived effectiveness, professional training needs, and ethical-normative concerns. Feedback is treated as a privileged analytical lens because it is the point at which AI capability encounters pedagogical judgement. The study therefore asks not merely whether teachers are willing to adopt AI, but how their feedback literacy and professional agency shape the educational legitimacy they attribute to AI-supported feedback.

Research Questions

Building upon the literature on formative feedback, feedback literacy, Artificial Intelligence in education, and professional agency, this study investigates teachers' baseline perceptions of AI-mediated feedback before participating in a structured professional development programme. Rather than examining technology adoption as an end in itself, the study explores how teachers evaluate the pedagogical integration of AI within one of the core practices of teaching and learning: formative feedback. Accordingly, the study addresses the following research questions:

RQ1. What beliefs do teachers hold regarding formative feedback and AI-mediated feedback before participating in professional development?

RQ2. What opportunities and barriers do teachers perceive in the use of AI to support formative feedback?

RQ3. Which underlying dimensions characterise teachers' perceptions of AI-mediated feedback, and what teacher profiles emerge from these perceptions?

By addressing these questions, the study seeks to move beyond technology acceptance models and contribute to a deeper understanding of how teachers negotiate the educational legitimacy of AI through feedback practices.

Methodology

This study adopts a quantitative baseline design within a broader research-action project investigating the pedagogical integration of Artificial Intelligence through Diana Laurillard's Conversational Framework. The overall project aims to support teachers in designing, implementing, and reflecting upon AI-mediated learning activities across different educational contexts. The present contribution focuses exclusively on the baseline phase, conducted before participants engaged in the professional development programme, in order to examine teachers' initial perceptions of AI-mediated feedback. Rather than evaluating the effects of training, the baseline provides a reference point for understanding teachers' existing beliefs, expectations, and perceived challenges concerning the integration of AI into formative feedback practices. The study involved 363 Italian teachers representing different educational levels, including kindergarten, primary, lower secondary, and upper secondary schools. Participation was voluntary and formed part of a national professional development initiative on Artificial Intelligence and innovative pedagogy. The sample included teachers with heterogeneous disciplinary backgrounds, teaching experience, and previous exposure to AI technologies, allowing the investigation of baseline perceptions across a broad educational population. Data were collected through a structured online questionnaire specifically developed for the research project. The instrument was theoretically informed by the literature on formative feedback, AI in education, feedback literacy, and Laurillard's Conversational Framework. The questionnaire explored three main dimensions: teachers' beliefs regarding formative feedback; perceived opportunities offered by AI-mediated feedback; perceived barriers to AI integration. Additional items investigated professional training needs, ethical and normative concerns, AI-supported feedback practices, and demographic characteristics. Responses were collected using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).The statistical analysis was conducted using a sequential analytical strategy. First, descriptive statistics were calculated to examine central tendency and variability across all questionnaire dimensions. Internal consistency was assessed using Cronbach's alpha to evaluate the reliability of the principal constructs. Inferential analyses were subsequently performed to explore relationships between teachers' characteristics and perceptions of AI-mediated feedback. Independent-samples t-tests and one-way analyses of variance (ANOVA) examined differences across participant groups, while Pearson correlation analyses investigated associations among the principal variables. To explore the underlying structure of teachers' perceptions, an Exploratory Factor Analysis (EFA) using Principal Component Analysis with Varimax rotation was conducted. The adequacy of the data for factor analysis was verified through the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. Finally, a cluster analysis was performed to identify distinct teacher profiles based on patterns of responses across the principal dimensions of the questionnaire. This person-centred approach enabled the identification of groups characterised by different combinations of beliefs, perceived opportunities, perceived effectiveness, and professional concerns regarding AI-mediated feedback. Participation in the study was voluntary and anonymous. Teachers completed the questionnaire before the beginning of the professional development activities and were informed that the collected data would be analysed exclusively for research purposes. All procedures complied with institutional guidelines concerning informed consent, confidentiality, and the ethical treatment of research participants.

Findings

The first research question investigated teachers' baseline beliefs regarding formative feedback and AI-mediated feedback before participating in the professional development programme.

Descriptive analysis indicates that teachers already attribute high pedagogical value to formative feedback (M = 4.14; α = .77). Across the sample, participants consistently recognised feedback as an essential component of effective teaching and learning, highlighting its importance for supporting student progress, monitoring understanding, and promoting continuous improvement. The reliability analysis confirmed satisfactory internal consistency of the construct, suggesting that teachers' beliefs regarding formative feedback were coherent across questionnaire items. These findings indicate that participants entered the professional development programme with an already well-established appreciation of formative feedback as a core pedagogical practice. The second research question examined teachers' perceptions of AI-supported feedback. Overall, teachers expressed moderately positive perceptions regarding the opportunities offered by Artificial Intelligence for formative feedback (M = 3.64; α = .87). The highest-rated opportunities concerned immediate feedback, learning analytics, personalised support, and the possibility of monitoring learning processes more efficiently. However, perceived effectiveness received considerably lower ratings (M = 3.16; α = .80). Although participants acknowledged AI's technical capabilities, they expressed greater uncertainty regarding its actual contribution to improving teaching and learning processes. The difference between these two dimensions suggests that teachers distinguished between recognising AI's potential functionalities and evaluating their educational usefulness. Teachers identified professional preparation as the most significant challenge for integrating AI into formative feedback practices. The perceived need for professional training obtained the highest mean score among all barrier-related dimensions (M = 4.13), indicating widespread recognition that effective AI integration requires specific pedagogical competencies. Reliability analyses further showed that professional training needs and ethical-normative concerns did not belong to a single underlying construct. Rather, they emerged as conceptually distinct dimensions, suggesting that teachers differentiate between acquiring operational competence and addressing broader ethical or regulatory issues associated with AI. To investigate the underlying structure of teachers' perceptions, an Exploratory Factor Analysis was conducted. The analysis revealed a two-factor solution accounting for a substantial proportion of the total variance. The first factor grouped items associated with AI capabilities, including immediate feedback, personalisation, learning analytics, and technological support for instructional processes. The second factor included items referring to the perceived educational effectiveness of AI-supported feedback, reflecting teachers' evaluation of its pedagogical contribution to learning. The factor structure therefore distinguished between perceptions of technological capability and perceptions of educational effectiveness. Cluster analysis revealed three distinct profiles of teachers. The first profile consisted of teachers characterised by high confidence in both AI opportunities and educational effectiveness. These participants demonstrated strong readiness to integrate AI into formative feedback practices. The second profile, representing the majority of the sample, included teachers who recognised AI's potential while maintaining reservations regarding its pedagogical effectiveness. This group was labelled *Open but Cautious*. The third profile included teachers reporting comparatively lower confidence in both AI opportunities and effectiveness, indicating a lower level of readiness for AI integration.These findings reveal considerable heterogeneity in teachers' baseline perceptions and suggest that different professional development needs may characterise different teacher profiles.

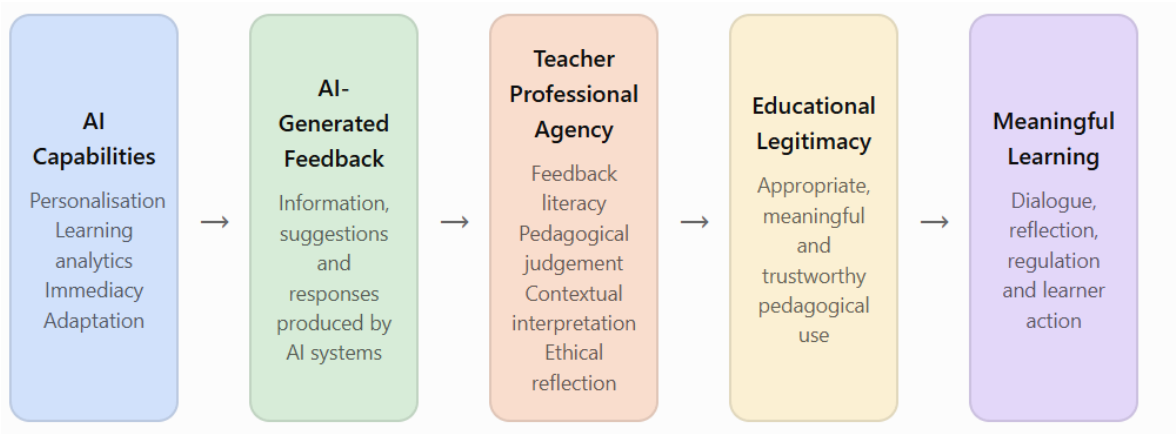
Discussion

The findings contribute to the growing literature on Artificial Intelligence in education by shifting attention from technology adoption towards pedagogical judgement. Rather than asking whether teachers are willing to use AI, the present study examined how they evaluate

AI when it becomes embedded within one of the most pedagogically significant practices of teaching: formative feedback. Research on AI in education has frequently examined teachers' attitudes, acceptance, trust, or intention to use AI systems. While these perspectives remain important, they primarily describe teachers' relationships with technology itself. The present findings suggest a different interpretation. Teachers do not appear to evaluate AI exclusively according to its technical characteristics. Instead, they assess its contribution through the educational functions it is expected to support. In this study, feedback represents the pedagogical context through which AI is interpreted. This perspective extends existing technology acceptance approaches by introducing pedagogical judgement as a central explanatory dimension. The consistently high valuation of formative feedback demonstrates that teachers already possess a well-established feedback culture before engaging with AI. Consequently, AI does not introduce feedback into educational practice; rather, it enters an already existing pedagogical process. This distinction is theoretically important because it positions feedback not simply as one possible application of AI but as the pedagogical environment in which teachers negotiate the educational value of AI-generated information. From the perspective of Laurillard's Conversational Framework, AI-generated feedback becomes meaningful only when incorporated into iterative cycles of dialogue, reflection, adaptation, and action. Immediate responses alone cannot sustain learning unless they are pedagogically interpreted within these conversational processes. Perhaps the most significant contribution of this study concerns the role of professional agency. Teachers recognised numerous technological opportunities offered by AI while simultaneously expressing greater caution regarding its educational effectiveness. This distinction suggests that teachers separate what AI is capable of doing from what they believe should be educationally valued. Professional agency therefore emerges as the mechanism through which teachers evaluate, interpret, adapt, and contextualise AI-generated feedback before incorporating it into teaching practice. Following Priestley et al. (2015), agency should not be understood as an individual characteristic but as an ecological achievement emerging from professional knowledge, contextual conditions, educational values, and pedagogical judgement. Within AI- mediated feedback environments, teachers do not simply receive technological outputs; they actively determine their educational legitimacy. This interpretation is represented in the conceptual model proposed in Figure 1.

Figure 2

A Conceptual Model of AI Integration Through Professional Agency



The model proposes that AI does not directly improve learning. Instead, AI generates information that only becomes educationally meaningful when teachers transform it into pedagogically legitimate feedback through their professional judgement. The distinction

emerging from the factor analysis between technological capability and educational effectiveness provides empirical support for introducing the concept of educational legitimacy. Educational legitimacy refers to teachers' judgement regarding whether AI-generated feedback is appropriate, meaningful, trustworthy, and educationally valuable within a particular pedagogical context. Unlike technological capability, which depends on the performance of AI systems, educational legitimacy depends upon teachers' interpretation of those performances in relation to curriculum, learner needs, educational aims, and classroom relationships. The findings therefore suggest that successful AI integration depends less on increasing technological functionality than on strengthening teachers' capacity to exercise informed pedagogical judgement. The prominence of professional training as the principal perceived barrier has important implications for teacher education. Professional development should move beyond technical instruction concerning AI tools and instead cultivate teachers' feedback literacy, AI literacy, and professional agency. Preparing teachers for AI-supported education requires developing their ability to critically evaluate AI-generated feedback, integrate it within pedagogically coherent learning designs, and maintain responsibility for educational decisions. Such an approach aligns with recent international recommendations advocating human-centred and pedagogically grounded AI integration in education.

Conclusion

This study examined how teachers perceive Artificial Intelligence when it is introduced into formative feedback practices. Moving beyond a general focus on technological acceptance, the analysis explored the distinction teachers make between the opportunities offered by AI and its perceived educational effectiveness. The findings show that participants entered the professional development programme with a strong pre-existing appreciation of formative feedback. They also recognised the potential of AI to support immediacy, personalisation, learning analytics, and the monitoring of learning processes. However, their evaluation of AI's actual educational effectiveness was more cautious. This difference suggests that teachers do not automatically equate technological capability with pedagogical value. On this basis, the study proposes that professional agency plays a mediating role between AI-generated feedback and its educational use. AI systems can produce information, suggestions, and responses, but these outputs do not constitute pedagogically meaningful feedback by themselves. Teachers must interpret them in relation to learners, curriculum aims, classroom contexts, ethical considerations, and the intended learning process. Through this professional judgement, AI-generated information may acquire educational legitimacy. The proposed conceptual model therefore describes a progression from AI capabilities to AI-generated feedback, teacher professional agency, educational legitimacy, and meaningful learning. The model should not be interpreted as a deterministic causal sequence. Rather, it offers an interpretative framework for understanding how teachers may transform technological outputs into educationally meaningful feedback.

The study also highlights the importance of professional development. Training should not be limited to the operational use of AI tools but should strengthen feedback literacy, pedagogical judgement, ethical awareness, and teachers' capacity to make context-sensitive decisions. AI literacy should consequently be understood as both a technological and a pedagogical competence. Several limitations should be acknowledged. The study is based on self-reported baseline perceptions from a voluntary sample of Italian teachers and does not measure classroom implementation or student learning outcomes. The exploratory factor and cluster solutions also require confirmation with further samples. Future phases of the research-action programme will examine how teachers' perceptions evolve through professional development

and how AI-mediated feedback is designed, implemented, and revised in practice. Ultimately, the educational value of AI does not reside solely in what the technology can generate. It depends on teachers' capacity to determine when, why, and under which pedagogical conditions its outputs can legitimately contribute to meaningful learning.

References

Carless, D., & Boud, D. (2018). The development of student feedback literacy: Enabling uptake of feedback. *Assessment & Evaluation in Higher Education, 43*(8), 1315–1325. https://doi.org/10.1080/02602938.2018.1463354

Carless, D., & Winstone, N. E. (2023). Teacher feedback literacy and its interplay with student feedback literacy. *Teaching in Higher Education, 28*(1), 150–163. https://doi.org/10.1080/13562517.2020.1782372

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. https://doi.org/10.2307/249008

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112. https://doi.org/10.3102/003465430298487

Laurillard, D. (2012). *Teaching as a design science: Building pedagogical patterns for learning and technology*. Routledge.

Miao, F., & Cukurova, M. (2024). *AI competency framework for teachers*. UNESCO.

Miao, F., & Holmes, W. (2023). *Guidance for generative AI in education and research*. UNESCO. https://doi.org/10.54675/UZCO6644

Priestley, M., Biesta, G., & Robinson, S. (2015). *Teacher agency: An ecological approach*. Bloomsbury Academic.

Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research, 78*(1), 153–189. https://doi.org/10.3102/0034654307313795

Bridging Statistics Education and Professional Practice in Economics and Business Degrees

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Abstract

Statistics plays a key role in Economics and Business programmes, yet students often perceive it as abstract and disconnected from professional practice, which can reduce motivation and hinder knowledge transfer. Research on teaching innovation highlights the value of active and contextualized approaches to improve engagement in quantitative subjects (Biggs et al., 2022). In statistics education, negative attitudes are frequently linked to limited real-world context and weak exposure to authentic applications (Garfield et al., 2008). Previous studies suggest that involving external professionals can foster experiential learning and strengthen transversal skills such as decision-making and critical thinking, particularly when activities are well aligned with course objectives (Coleman, 2013; Kirby & Turner, 2024; Ormrod, 2004). To address these challenges, an external-expert session was introduced in the course Introduction to Economic Statistics within the Professionals in the Classroom initiative at the University of Oviedo. The session was co-led by a senior statistics officer from the Asturian Society for Economic and Industrial Studies (SADEI) and aimed to demonstrate the professional relevance of key statistical concepts through applied examples. The activity consisted of an introductory presentation on the role of official statistics in economic and social analysis, followed by two short workshops focused on business investment decisions and public-sector prioritization using demographic and socioeconomic data. Student feedback collected through a satisfaction survey was highly positive, indicating that professional engagement enhances perceived relevance and supports learning outcomes in introductory statistics courses.

Keywords: statistics education, higher education innovation, professional engagement

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Introduction

Statistics constitutes a fundamental component in the education of graduates in Economics and Business, as it equips students with the analytical tools required to interpret economic phenomena, support decision-making processes, and communicate empirical evidence based on data. Nevertheless, despite the expanding availability of data and the increasing demand for quantitative skills in the labour market, Statistics teaching continues to face a persistent challenge: students often regard the subject as highly abstract and detached from professional practice. This perception has been shown to undermine motivation, limit conceptual understanding, and hinder the transfer of statistical knowledge to real-world contexts (Garfield et al., 2008).

Although the tension between theoretical content and practical application is common across many quantitative disciplines within the social sciences, it appears to be especially pronounced in Statistics. The formal structure of the subject, the intensive use of mathematical language, and the frequent lack of explicit links to applied economic problems can foster negative student attitudes that tend to persist over time rather than diminish as studies progress (Gal & Ginsburg, 1994; Onwuegbuzie & Wilson, 2003).

Research on innovation in higher education has proposed several strategies to narrow this gap between theory and practice. In particular, experiential learning approaches (Kolb, 1984) and the incorporation of external professionals into academic settings have attracted considerable attention due to their potential to promote deeper learning and assign practical meaning to curricular content (Coleman, 2013; Ormrod, 2004). Empirical evidence suggests that collaboration with professionals from the world of work not only increases student engagement, but also reinforces perceptions of relevance and supports the development of more durable and transferable forms of knowledge (Kirby & Turner, 2024).

Against this background, the present paper analyses a teaching innovation developed within the institutional initiative Professionals in the Classroom at the University of Oviedo, which seeks to incorporate external expertise into undergraduate teaching. During the 2024–2025 academic year, this initiative was applied to the subject Introduction to Economic Statistics through the participation of a professional statistician from the Asturian Society of Economic and Industrial Studies (SADEI). The activity combined an introductory session on the role of official statistics with two practical workshops focused on the use of real data to support decision-making processes. According to the results of a satisfaction survey administered to participants, the initiative was very positively received by students.

Accordingly, this article pursues two main objectives. First, it provides a detailed description of the design, implementation, and pedagogical features of the experience. Second, it evaluates its impact on students' perceptions and satisfaction based on the analysis of survey data. The remainder of the paper is structured as follows. Section 2 reviews the relevant literature on statistics education, experiential learning, and professional engagement. Section 3 outlines the institutional context and the design of the activity, while Section 4 describes its implementation. Sections 5 and 6 present the results and the main conclusions, respectively.

Theoretical Framework

Concerns regarding university students' attitudes toward Statistics have been widely documented in the specialist literature for several decades. Early studies by Roberts and

Bilderbeck (1980) and Wise (1985) already pointed to the existence of what later research conceptualised as statistical anxiety, defined as a combination of feelings of fear, tension, and apprehension when dealing with statistical content. Subsequent research has consistently shown that this phenomenon negatively affects both academic performance and students' willingness to engage with statistical tools in their future professional practice (Cruise et al., 1985; Onwuegbuzie & Wilson, 2003).

Within Economics and Business programmes, the work of Garfield et al. (2008) identifies the scarcity of meaningful real-world context as one of the most influential factors explaining these negative attitudes. When students fail to recognise how statistical procedures relate to the types of problems they expect to encounter in their professional careers, motivation tends to decline markedly. As a result, learning is often reduced to the mechanical memorisation of formulas and algorithms, with limited conceptual understanding and little capacity for practical application. This situation is particularly striking given that organisational demand for analytical and data-related skills has continued to increase, fuelled by the growing availability and strategic value of data.

An additional challenge arises from the intrinsic characteristics of Statistics as a discipline. Unlike other subject areas, statistical learning requires the simultaneous integration of mathematical competence, logical reasoning, and the interpretation of results within a substantive context. This multidimensional nature makes traditional teaching approaches less effective in fostering deep understanding, highlighting the need for instructional strategies that move beyond content transmission (Biggs et al., 2022).

From the perspective of experiential learning theory, Kolb (1984) argues that learning is most effective when it follows a cyclical process involving concrete experience, reflective observation, abstract conceptualisation, and active experimentation. Under this framework, purely theoretical instruction is insufficient for meaningful learning to occur; instead, students must be given opportunities to actively engage with concepts, reflect on their use, and apply them in relevant contexts.

The application of experiential learning principles to Statistics education has led to the adoption of a range of pedagogical strategies, including project-based work with real datasets, the use of case studies, and the involvement of external professionals in teaching activities (Chance & Rossman, 2006; Cobb, 1992). A common feature of these approaches is the contextualisation of learning in scenarios that closely resemble the professional environments in which statistical knowledge will later be used.

In parallel, Biggs et al. (2022) emphasise, through their model of constructive alignment, the importance of ensuring coherence between learning outcomes, teaching activities, and assessment methods. Applied to Statistics in Economics and Business degrees, this implies designing educational experiences that replicate key aspects of professional reasoning: identifying relevant problems, selecting appropriate data, applying suitable statistical techniques, and interpreting results within an economic or business framework.

Research on the integration of external experts into university teaching has generally reported positive outcomes, while also highlighting important design considerations. Coleman (2013), in a study specifically focused on the participation of professional statisticians in higher education, concludes that such initiatives can enhance student motivation, clarify the practical relevance of statistical content, and reduce the disconnect between academic instruction and

labour market demands. However, the author cautions that these benefits are strongly conditioned by the degree of curricular integration, noting that isolated or poorly connected interventions tend to generate only short-term and superficial effects.

Similarly, Ormrod (2004) argues that exposure to professional role models activates learning processes related to motivation and perceived self-efficacy. Drawing on social cognitive theory (Bandura, 1986), observing professionals applying statistical tools to real economic problems can help students develop more concrete and accessible mental representations of Statistics, thereby increasing their willingness to engage with the subject.

More recent evidence provided by Kirby and Turner (2024) reinforces these conclusions. Their analysis of guest speakers in Business degree programmes, both face-to-face and online, shows that well-planned interventions aligned with course objectives lead to significant improvements in students' perceptions of content relevance and their confidence in applying acquired knowledge. Key factors identified include the relevance of the expert's professional profile, the organisation of the intervention around specific cases or problems, and opportunities for student interaction through questions or guided activities.

Taken together, these findings are consistent with the principles of situated learning theory (Lave & Wenger, 1991), which highlight the importance of learning through authentic practices or environments that realistically mirror them. The temporary presence of an active professional in the university classroom can thus be understood as creating a meaningful point of contact between the academic and professional communities, fostering more situated and relevant learning experiences.

Experience Design

The teaching experience analysed in this study was developed within the framework of the Professionals in the Classroom initiative, promoted by the University of Oviedo as a strategy to enrich undergraduate education through the systematic incorporation of professionals from outside academia into regular teaching activities. This programme is rooted in a broader concern within the Spanish university system regarding the need to strengthen connections between higher education and the labour market, in line with competency-based learning approaches and employability-oriented educational policies.

The initiative provides an institutional structure that facilitates collaboration between university lecturers and external professionals by regulating key aspects such as expert selection, prior coordination, integration of the activity into the curriculum, and subsequent evaluation. Participation is voluntary for academic staff, who identify and propose professionals whose profiles are considered particularly suitable for the learning objectives and content of their courses. The university, in turn, offers administrative and logistical support and manages the formal recognition of the external professional's contribution.

The experience was implemented in the course Introduction to Economic Statistics, a compulsory subject taught in the early stages of several undergraduate degrees in Economics and Business at the University of Oviedo. The course aims to introduce students to the fundamentals of statistical reasoning and to basic descriptive and inferential techniques, with a clear emphasis on their application to economic and business-related phenomena. Given its position at the beginning of the degree programmes, the subject plays a crucial role in shaping students' initial attitudes towards Statistics. Many students enroll with preconceived negative

beliefs or a limited understanding of the subject's relevance to their future academic and professional trajectories.

The activity took place during the 2024–2025 academic year and was coordinated by the teaching staff responsible for the course. The Asturian Society of Economic and Industrial Studies (SADEI) was selected as the collaborating institution due to its strong thematic relevance, being the main reference body for official statistics on the Asturian economy, and its institutional and territorial proximity. These factors were considered especially valuable in reinforcing the link between course content and the regional economic environment in which many students are likely to pursue their professional careers.

The design of the experience was guided by four main objectives derived from both the identified needs of students and the principles of experiential learning discussed in the previous section. First, the activity sought to enhance student motivation by making the professional relevance of Statistics visible through direct interaction with a practicing statistician. Second, it aimed to illustrate current developments in applied data analysis, particularly the use of official statistics in economic analysis and public policy decision-making. Third, the activity was intended to strengthen students' perception of the practical usefulness of the course by explicitly linking statistical methods taught in class to their applications in business and public administration contexts. Finally, it aimed to provide students with an initial exposure to the types of reasoning, decision-making processes, and professional challenges characterising the work of statisticians, thereby contributing to the early formation of a professional identity.

The activity was structured into three main components combining information delivery with active student participation. The first component consisted of an introductory session led by the invited professional, which focused on explaining the role of official statistics within the economic information system. Particular emphasis was placed on the statistics produced by SADEI and their use in business decision-making, territorial planning, and public policy design. This initial session aimed to establish a meaningful reference framework and to motivate students by clearly connecting the statistical concepts addressed in the course to real-world applications.

The second and third components were organised as practical workshops. The second component presented a simulated business decision-making scenario based on fictitious statistical data, allowing students to engage, in a guided manner, with the process of statistical analysis applied to a management-related problem. The third component followed a similar structure but focused on the public sector, using real data and regional economic development indicators to illustrate how statistical analysis informs public policy evaluation.

A key feature of the experience was the explicit alignment between each of the three components of the activity and the specific content of the course syllabus. This design choice enabled students to clearly identify the correspondence between the statistical methods learned in regular lectures and their application during the expert-led sessions. Such curricular alignment, highlighted in the literature as a critical factor for the effectiveness of professional engagement initiatives (Coleman, 2013; Kirby & Turner, 2024), was ensured through prior coordination between the course instructor and the invited professional.

Experience Implementation

Prior to the activity, students were informed by the teaching staff about the purpose and structure of the session, which was explicitly framed within the Professionals in the Classroom initiative. This initial briefing also clarified the connection between the expert's intervention and the contents of the course syllabus. The intention of this preparatory stage was to activate relevant prior knowledge, situate the activity within the broader learning objectives of the subject, and foster positive expectations regarding its potential usefulness.

The session was conducted during regular class time, without requiring any modification to the established weekly schedule. This smooth integration into the usual teaching dynamics facilitated student attendance and engagement, avoiding many of the logistical barriers often associated with extracurricular activities. The first part of the session adopted an expository format but was delivered in an interactive manner that encouraged student participation. During this block, the external expert presented the system used by SADEI for the production and dissemination of official statistics, explaining its functioning in an accessible and context-sensitive way. The presentation was illustrated with concrete examples related to the Asturian economy and supported by visual materials such as statistical tables and data visualisations, which students could readily relate to the representations used in their regular Statistics classes.

The second and third parts of the session were organised as practical workshops based on materials specifically prepared for the activity using data provided by SADEI. In the workshop focused on business decision-making, students analysed sectoral indicators and regional economic activity data in order to support a series of management-related decisions. The workshop centred on the public sector followed a similar structure, using labour market, demographic, and social welfare indicators to illustrate the evaluation of a regional public policy measure. In both cases, the guest professional guided students through the analytical process, highlighted the limitations of the available data, and introduced practical considerations related to data availability, update frequency, and comparability. These aspects enriched the more formal statistical analysis typically addressed in the course.

A key element of the implementation was the emphasis placed on fostering interaction between the students and the invited professional. Rather than following a one-directional lecture model, the session actively promoted questions, discussion of cases, and the exchange of viewpoints regarding the interpretation and implications of the data examined. This interactive format is consistent with evidence identifying student–expert interaction as a critical factor in the effectiveness of professional engagement activities in higher education (Kirby & Turner, 2024).

Finally, the experience was evaluated through a student satisfaction survey administered after the session. The questionnaire consisted of four main items assessing overall satisfaction with the Professionals in the Classroom activity, perceived usefulness and relevance of the content addressed, satisfaction with the external expert's presentation, and the overall usefulness of the expert's visit. Each item was rated on a numerical scale ranging from 0 to 10, and students were also given the opportunity to provide open-ended qualitative comments. The survey was administered via the University of Oviedo's institutional online platform, ensuring respondent anonymity and facilitating systematic data collection and analysis.

Experience Results

The satisfaction survey was completed by students enrolled in different groups of the course Introduction to Economic Statistics across several Economics and Business degree programmes, all of whom participated in the activity described above. Although the number of responses was limited, a factor that constrains the generalisability of the findings and will be addressed in more detail in the section on limitations, the data obtained offer relevant insights into students' perceptions of the experience and are consistent with results reported in previous studies on similar initiatives (Coleman, 2013; Kirby & Turner, 2024).

An additional strength of the sample lies in the diversity of participating students, who were drawn from different class groups taught by different instructors. This heterogeneity reduces the likelihood that the evaluations were driven by a single teaching context or instructor-specific effects. Moreover, the voluntary and anonymous nature of the survey helps to mitigate potential social desirability bias and supports the credibility of the responses.

Table 1 summarises the main descriptive statistics for each of the four items included in the survey, reporting minimum and maximum values as well as arithmetic means on a scale ranging from 0 to 10.

Table 1
Descriptive Statistics From the Satisfaction Survey (0–10 Scale)

Item	Min	Max	Mean
Overall satisfaction with the activity	5	10	8.44
Satisfaction with and usefulness of the content	4	10	8.00
Satisfaction with the expert's presentation	8	10	9.33
Benefits of having an external expert visit	5	10	8.11

Source: Own elaboration.

Overall, the results indicate very positive student evaluations of the experience. Mean overall satisfaction with the Professionals in the Classroom activity reached 8.44 points, with relatively high ratings across respondents. This level of satisfaction is well above commonly used thresholds for positive evaluation and aligns with findings from previous research on the integration of external professionals in university teaching (Coleman, 2013; Kirby & Turner, 2024), suggesting that the activity was perceived as providing substantial added value.

Perceived satisfaction with, and usefulness of, the content covered by the activity yielded a mean score of 8.00. Although this item showed greater dispersion than the others, with responses ranging from 4 to 10, the average rating remains clearly positive. The wider range may reflect heterogeneity in students' prior statistical knowledge, expectations regarding the activity, or differences across class groups, but does not undermine the overall favourable assessment of the content.

The highest-rated dimension was satisfaction with the guest expert's presentation, which achieved a mean score of 9.33 and a narrow range between 8 and 10. This result is particularly noteworthy. First, it underscores the importance of the professional's profile and communication skills as key factors influencing the effectiveness of such initiatives, in line with the recommendations highlighted in the literature (Coleman, 2013). Second, the consistency of the ratings suggests that students' positive perception of the expert's contribution was largely independent of individual or contextual differences.

The perceived benefits of hosting an external expert also received a high mean score of 8.11, with values ranging from 5 to 10. The close alignment between this item and those measuring overall satisfaction and content-related satisfaction indicates coherence in students' responses, with no major discrepancies between general appreciation of the activity and its perceived usefulness. Such consistency is commonly observed in evaluations of innovative teaching practices and is considered an indicator of internal validity (Biggs et al., 2022).

A combined interpretation of the four survey items allows for several relevant insights. First, the fact that the highest ratings correspond to the expert's presentation reinforces the central role of the experiential component of the activity, namely, direct exposure to a practising professional who routinely applies statistical tools in real contexts. This finding supports well-established arguments in the literature regarding the motivational and educational value of professional role models in quantitative disciplines (Bandura, 1986; Ormrod, 2004).

Second, the presence of comparatively lower minimum scores in the items related to content usefulness and overall usefulness of the visit suggests that a small subset of students did not find the activity particularly relevant. While the limited sample size precludes definitive conclusions, several plausible explanations can be considered, including mismatches between individual expectations and the design of the activity, differences in interest between applied and more methodological aspects of Statistics, or group-specific contextual factors.

Finally, the convergence of the present results with previous empirical evidence, particularly that reported by Coleman (2013) and Kirby and Turner (2024), supports the interpretation that the positive evaluations reflect a genuine impact of the activity on students' motivation and perceptions of relevance, rather than a short-lived novelty effect or a courtesy bias. Nevertheless, a more robust assessment of impact would require longitudinal designs and the inclusion of comparison groups to examine whether these attitudinal effects persist over time, an issue that constitutes a promising direction for future research.

Conclusion

This study has presented and assessed an experiential learning initiative implemented in the course Introduction to Economic Statistics at the University of Oviedo, based on the participation of a professional statistician from the Asturian Society of Economic and Industrial Studies (SADEI) within the framework of the Professionals in the Classroom programme. Evidence from the student satisfaction survey indicates consistently high levels of approval across all evaluated dimensions, with average scores above 8 out of 10 and particularly strong ratings for the quality of the expert's presentation (M = 9.33).

Taken together, these findings suggest several relevant conclusions. First, they indicate that the structured involvement of external professionals in university teaching, when carefully planned, aligned with the curriculum, and coordinated between lecturers and guest experts, can serve as an effective mechanism for enhancing student motivation in statistics courses and reinforcing perceptions of the practical relevance of statistical content. Second, the experience provides empirical support for the applicability of experiential learning approaches in Economics and Business degree programmes, where reducing the gap between academic knowledge and professional practice constitutes a key pedagogical objective. Third, the Professionals in the Classroom initiative at the University of Oviedo emerges as an appropriate institutional framework for sustaining this type of collaboration, offering the organisational support and formal recognition necessary to ensure continuity and scalability.

From a curriculum design perspective, these results suggest that professional engagement activities should not be conceived as isolated or exceptional events, but rather as an integral component of teaching strategies in applied statistics courses. More broadly, they highlight the potential value of systematically embedding such experiences in quantitative subjects aimed at developing analytical skills with direct relevance to the labour market. In this regard, the consolidation of stable partnerships with local institutions and organisations, together with the progressive refinement of pedagogical design, appear as central elements for the future development of the initiative.

Several limitations of the study must nevertheless be acknowledged. The relatively small sample size restricts the generalisability of the findings, although their consistency with existing literature lends them credibility. In addition, the absence of a control group prevents a clear identification of causal effects attributable solely to the intervention, and the use of an immediate post-activity survey does not allow for an assessment of longer-term impacts on learning outcomes or the transfer of statistical competencies to new contexts.

Despite these limitations, the experience described has implications that extend beyond the specific context of Economic Statistics. Similar challenges concerning the perceived distance between theoretical instruction and professional application are present in other quantitative disciplines within the social sciences, such as Financial Mathematics, Econometrics, or Data Analysis. The systematisation and dissemination of initiatives of this kind, particularly when supported by institutional programmes like Professionals in the Classroom, therefore represent a meaningful contribution to the advancement of teaching innovation in higher education.

References

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Biggs, J., Tang, C., & Kennedy, G. (2022). *Teaching for quality learning at university* (5.ª ed.). Open University Press.

Chance, B., & Rossman, A. (2006). Using simulation to teach and learn statistics. In A. Rossman & B. Chance (Eds.), Working cooperatively in statistics education: Proceedings of the Seventh International Conference on Teaching Statistics. International Statistical Institute.

Cobb, G. W. (1992). Teaching statistics. In L. A. Steen (Ed.), *Heeding the call for change: Suggestions for curricular action* (pp. 3–43). Mathematical Association of America.

Coleman, S. Y. (2013). The role of external speakers (working statisticians) in the Higher Education statistics classroom. In *Proceedings of the 59th World Statistics Congress of the International Statistical Institute* (Paper IPS069). International Statistical Institute.

Cruise, R. J., Cash, R. W., & Bolton, D. L. (1985). Development and validation of an instrument to measure statistical anxiety. In *Proceedings of the Annual Meeting of the Statistical Education Section of the American Statistical Association* (pp. 92–98). American Statistical Association.

Gal, I., & Ginsburg, L. (1994). The role of beliefs and attitudes in learning statistics: Towards an assessment framework. *Journal of Statistics Education, 2*(2). https://doi.org/10.1080/10691898.1994.11910471

Garfield, J. B., Ben-Zvi, D., Chance, B., Medina, E., Roseth, C., & Zieffler, A. (Eds.). (2008). *Developing students' statistical reasoning: Connecting research and teaching practice*. Springer. https://doi.org/10.1007/978-1-4020-8383-9

Kirby, A., & Turner, B. (2024). Guess who's coming to dinner! The impact of (virtual) guest speakers in a business class: A student perspective. In *Education and New Developments 2024* (pp. 124–127). https://doi.org/10.36315/2024v1end026

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Onwuegbuzie, A. J., & Wilson, V. A. (2003). Statistics anxiety: Nature, aetiology, antecedents, effects, and treatments—A comprehensive review of the literature. *Teaching in Higher Education, 8*(2), 195–209. https://doi.org/10.1080/1356251032000052447

Ormrod, N. G. (2004). *The use of guest speakers, company visits and professional bodies' events in the curriculum*. Manchester Metropolitan University.

Roberts, D. M., & Bilderbeck, E. W. (1980). Reliability and validity of a statistics attitude survey. *Educational and Psychological Measurement, 40*(1), 235–238.

Wise, S. L. (1985). The development and validation of a scale measuring attitudes toward statistics. *Educational and Psychological Measurement, 45*(2), 401–405. https://doi.org/10.1177/001316448504500226

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Designing Inclusive Learning Experiences to Reduce Dropout Rates in Emirati Foundation Programs

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Abstract

Foundation programs in the United Arab Emirates (UAE) represent a critical transition stage between secondary and higher education, yet early academic disengagement and withdrawal remain persistent concerns. This study examines how intentionally designed inclusive learning experiences can enhance student engagement, academic performance, and retention among first-year Emirati students in foundation-level English courses. Grounded in principles of Universal Design for Learning (Meyer et al., 2014), constructivist learning theory (Vygotsky, 1978), and research on student retention and engagement (Tinto, 2012), the study investigates the impact of early diagnostic assessment, differentiated instruction, structured collaborative learning, and scaffolded formative feedback implemented over one academic semester. A mixed-method classroom-based inquiry was conducted using attendance patterns, assessment performance data, withdrawal trends, and student perception surveys. Findings indicate improved attendance consistency, narrowed performance gaps across proficiency levels, increased learner confidence and a measurable decline in withdrawal rates compared to previous cohorts. Students reported greater clarity of expectations, stronger academic belonging, and reduced assessment anxiety when provided with structured support and iterative feedback opportunities. The study argues that dropout prevention is closely linked to classroom-level instructional design rather than student deficit. By embedding inclusive pedagogical practices that anticipate learner diversity, educators can transform transitional learning environments into supportive academic spaces that promote persistence, engagement and resilience within foundation programs across the UAE.

Keywords: inclusive education, foundation programs, dropout reduction, Universal Design for Learning, student retention

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Introduction

Foundation programs occupy a distinctive position in the UAE higher education landscape because they connect secondary schooling, English-medium university expectations, and students' emerging academic identities. For many Emirati students, the foundation year is not simply a remedial bridge. It is a transition in which learners encounter new assessment practices, independent-study expectations, and classroom participation norms that can influence confidence and persistence.

Dropout and withdrawal in this context are more than administrative outcomes. They may reflect accumulated experiences of absence, assessment anxiety, weak belonging, or uncertainty about whether higher education is a place where the student can succeed. Retention scholarship emphasizes that persistence is shaped by interactions between students and institutional environments rather than by student motivation alone (Tinto, 2012). In foundation classrooms, teaching design, feedback practices, and peer relationships can therefore influence whether students continue to attend and engage.

This study examines inclusive learning experiences as a classroom-level retention strategy for Emirati foundation English students. Inclusive learning is defined here as planned teaching that anticipates learner variability, offers multiple ways to access content, structures collaboration, provides usable feedback before final assessment, and communicates that all students can progress. The study involved 180 Emirati foundation students and considered four evidence sources: attendance, course grades, withdrawal outcomes, and a student perception survey. The purpose was to connect inclusive pedagogy with measurable retention indicators and to show how the course itself can become an early support environment.

Literature Review

Foundation programs are designed to prepare students for the linguistic, academic, and self-regulatory demands of tertiary education. In English-medium institutions, foundation English courses often function as high-stakes gateways to degree progression. Transition pedagogy argues that first-year curricula should deliberately scaffold belonging, engagement, and academic success for diverse commencing students (Kift et al., 2010). Within the UAE, attrition may involve academic difficulty, personal circumstances, institutional fit, and perceptions of future opportunity (Ashour, 2019). These factors suggest that retention strategies must address academic and relational needs together.

Universal Design for Learning (UDL) provides a proactive framework for reducing barriers. It encourages multiple means of engagement, representation, and action or expression so that learning environments are accessible from the beginning (CAST, 2024; Meyer et al., 2014). In a foundation English class, barriers may include unclear assignment expectations, fast-paced instruction, limited examples of successful work, few opportunities for practice, or classroom norms that discourage lower-proficiency students from participating. Inclusive pedagogy does not reduce academic rigor; it clarifies routes toward rigorous outcomes.

Constructivist learning theory further supports this approach. Learning develops through interaction, practice, and reflection, while scaffolding enables students to perform beyond their current independent level (Vygotsky, 1978). In foundation English classrooms, scaffolds may include model texts, sentence frames, staged writing tasks, peer rehearsal, guided vocabulary practice, and short feedback conferences. Collaboration is especially valuable when roles, task

steps, and success criteria are explicit because students gain more opportunities to use language while also recognizing that peers experience similar challenges.

Feedback and assessment confidence are central to retention. Students who receive low marks early in the semester may interpret them as fixed evidence of inability if feedback is delayed or difficult to use. Effective feedback clarifies goals, current performance, and next steps (Hattie & Timperley, 2007), and supports self-regulated learning when students can apply comments to improve work (Nicol & Macfarlane-Dick, 2006). Engagement and belonging also matter. Kahu (2013) frames engagement as a construct shaped by student and institutional factors, while Strayhorn (2012) identifies belonging as a basic educational need. In foundation programs, inclusive classrooms can strengthen belonging by normalizing help-seeking, structuring respectful peer interaction, and making progress visible.

Theoretical Framework

The study integrates UDL, constructivist learning theory, and student retention theory. UDL provides the design principle: learning environments should anticipate variability and provide multiple routes to participation and expression. Constructivist theory provides the learning mechanism: students build understanding through guided practice, scaffolding, interaction, and reflection. Retention theory provides the outcome explanation: students are more likely to persist when they feel academically integrated, socially connected, and capable of success.

In the conceptual model, inclusive instructional practices are the intervention conditions. These practices include diagnostic assessment, differentiated instruction, collaborative learning, formative feedback, flexible participation, and mentoring conversations. Engagement, academic confidence, and belonging operate as mediating processes, while attendance, course performance, and persistence are outcome indicators. The model assumes that inclusive design reduces dropout risk by making the learning environment more predictable, supportive, and responsive before disengagement becomes irreversible.

Methodology

The study used a quantitative classroom-based design with descriptive and correlational analysis. This design was appropriate because the research focused on measurable indicators: survey responses, attendance records, course grades, and withdrawal status. The sample consisted of 180 Emirati students enrolled in foundation-level English courses at a UAE higher education institution. Students represented different foundation levels and initial English proficiency groups.

The inclusive learning intervention was implemented across one academic semester. It began with diagnostic assessment to identify language needs, confidence levels, and possible risk indicators. Differentiated instruction then adjusted task complexity, support structures, and learning materials. Collaborative learning was structured through pair work, group roles, peer review, and guided discussion. Formative feedback was provided through rubrics, examples, teacher comments, revision opportunities, and short conferences. Academic belonging support included flexible participation routines and mentoring conversations that encouraged attendance and reframed difficulty as part of learning.

The student survey contained 25 Likert-scale items across five constructs: engagement and motivation, inclusive instruction, feedback and assessment confidence, belonging and

collaboration, and persistence and dropout reduction. Four data sources were analyzed: survey responses, attendance records, course grades, and withdrawal data. Internal consistency was assessed using Cronbach's alpha. Descriptive statistics summarized perceptions and outcomes, Pearson correlations examined relationships among constructs, and multiple regression estimated predictors of persistence intention. Ethical considerations included confidentiality, voluntary participation, aggregate reporting, and secure handling of sensitive academic data.

Table 1
Instrument Constructs and Reliability

Scale	Items	No. of items	Cronbach alpha
Engagement Motivation	Q01–Q05	5	0.907
Inclusive Instruction	Q06–Q10	5	0.901
Feedback Assessment Confidence	Q11–Q15	5	0.918
Belonging Collaboration	Q16–Q20	5	0.906
Persistence Dropout Reduction	Q21–Q25	5	0.924
Overall Inclusive Learning Scale	Q01–Q25	25	0.959

Results

Reliability results showed strong internal consistency across the five survey constructs and excellent reliability for the overall 25-item scale. This supports the use of construct means in correlation and regression analysis. The participant profile showed a balanced gender distribution, representation across foundation levels, and varied initial English proficiency, reflecting the learner variability typically found in foundation English classrooms.

Students reported positive perceptions across all survey constructs. Mean scores were above the scale midpoint, indicating agreement that inclusive learning practices supported engagement, differentiated learning, feedback clarity, belonging, and persistence. Attendance improved from a pre-intervention mean of 75.39% to a post-intervention mean of 88.02%. Course grades improved from a pre-intervention mean of 68.04 to a post-intervention mean of 79.01. These descriptive gains suggest stronger behavioral engagement and academic performance after implementation.

Withdrawal was approximately 8% during the intervention semester compared with a historical baseline of around 18%. Correlations were positive among engagement, inclusive instruction, feedback confidence, belonging, attendance, course grade, and persistence intention. Regression results indicated that inclusive instruction, feedback confidence, belonging, and attendance were significant predictors of persistence intention, while engagement and course grade were not significant when the other variables were included. Overall, the results support the view that persistence is influenced by academic, emotional, and relational dimensions of the classroom experience.

Table 2
Participant Profile

Variable	Category	n	%
Gender	Female	93	51.7
Gender	Male	84	46.7
Gender	Prefer not to say	3	1.7
Age Group	18–19	98	54.4
Age Group	20–21	64	35.6
Age Group	22 or above	18	10.0
Foundation Level	Level 1	54	30.0
Foundation Level	Level 2	72	40.0
Foundation Level	Level 3	54	30.0
Program Track	Engineering/Technology	44	24.4
Program Track	Business	52	28.9
Program Track	Education	28	15.6
Program Track	Health Sciences	36	20.0
Program Track	Applied Media/Other	20	11.1
Initial English Proficiency	Low	48	26.7
Initial English Proficiency	Moderate	93	51.7
Initial English Proficiency	High	39	21.7
Previously Considered Withdrawal	Yes	42	23.3

Table 3
Descriptive Statistics for Survey Constructs

Construct	n	Mean	SD	Min	Max
Engagement Motivation	180	3.85	0.91	1.2	5.0
Inclusive Instruction	180	4.05	0.86	1.2	5.0
Feedback Assessment Confidence	180	3.99	0.92	1.0	5.0
Belonging Collaboration	180	3.88	0.85	1.8	5.0
Persistence Dropout Reduction	180	3.92	0.97	1.2	5.0

Table 4
Attendance and Academic Performance Indicators

Outcome	Mean	SD	Min	Max
Attendance before course (%)	75.39	8.59	49.2	96.0
Attendance after intervention (%)	88.02	6.23	71.4	100.0
Course grade before intervention	68.04	9.93	41.8	92.0
Course grade after intervention	79.01	7.64	58.7	97.9

Table 5
Correlation Matrix

Variable	Engagement	Inclusive Instruction	Feedback Confidence	Belonging	Persistence Intention	Attendance	Course Grade
Engagement	1.0	0.64	0.56	0.64	0.62	0.65	0.53
Inclusive instruction	0.64	1.0	0.58	0.62	0.59	0.44	0.44
Feedback confidence	0.56	0.58	1.0	0.53	0.63	0.45	0.56
Belonging	0.64	0.62	0.53	1.0	0.61	0.49	0.53
Persistence intention	0.62	0.59	0.63	0.61	1.0	0.64	0.49
Attendance	0.65	0.44	0.45	0.49	0.64	1.0	0.38
Course grade	0.53	0.44	0.56	0.53	0.49	0.38	1.0

Table 6
Regression Predicting Persistence Intention

Predictor	B	SE	t	p	Std. beta
Constant	-3.592	0.838	-4.29	< .001	
Engagement	0.032	0.083	0.39	0.699	0.03
Inclusive instruction	0.162	0.078	2.09	0.037	0.144
Feedback confidence	0.285	0.069	4.12	< .001	0.271
Belonging	0.208	0.079	2.64	0.008	0.183
Attendance	0.051	0.010	5.16	< .001	0.328
Course grade	0.004	0.008	0.51	0.611	0.031

Discussion

The findings support the argument that inclusive instructional design can contribute to dropout reduction in Emirati foundation programs. Improved attendance suggests that students were more willing to participate when lessons were structured, relevant, and supportive. Since attendance is often an early warning indicator, improved consistency gives instructors more opportunities to provide feedback, build confidence, and prevent disengagement.

The improvement in course grades is also meaningful. Foundation students with lower initial proficiency may be discouraged by early assessment experiences, particularly when success criteria are unclear. Differentiated tasks and formative feedback can interrupt this pattern by creating manageable steps toward improvement. The findings therefore support the claim that inclusive design does not lower expectations; instead, it provides clearer and more equitable routes toward meeting them.

Survey findings show that students valued feedback clarity, collaboration, and belonging. These are not simply preferences; they are mechanisms through which retention may be strengthened. When students understand expectations, they are less likely to feel helpless. When they can practise before assessment, they are less likely to interpret anxiety as failure. When they work respectfully with peers, they are less likely to feel isolated. In this sense, the foundation classroom can function as an early retention system.

The results also suggest that dropout should not be understood only as a student decision or administrative status. If withdrawal can begin with classroom confusion, fear, or disconnection, then teaching design becomes central to prevention. Inclusive pedagogy should therefore be treated as part of student-success infrastructure. For foundation programs, practical implications include embedding diagnostic assessment, visible feedback cycles, structured collaboration, belonging-building routines, and early progress monitoring into normal teaching practice.

Conclusion

This study examined how inclusive learning experiences can reduce dropout risk among Emirati students in UAE foundation programs. The intervention was associated with improved attendance, stronger course performance, positive student perceptions, and a lower withdrawal rate than the historical baseline. The central contribution is the argument that retention begins in the classroom: students are more likely to persist when expectations are visible, support is timely, feedback is usable, and the learning environment communicates belonging.

The findings have practical implications for foundation programs seeking scalable approaches to student success. Inclusive design can be embedded through early diagnostic tasks, differentiated materials, structured peer learning, formative feedback cycles, mentoring conversations, and routine monitoring of attendance and confidence. However, the study should be interpreted with caution because classroom-based research is shaped by instructor practice, semester conditions, and student characteristics. Future research should examine multi-institutional samples, longitudinal progression beyond the foundation year, and qualitative accounts of how students experience belonging, feedback, and persistence. Overall, inclusive pedagogy offers a practical and theoretically grounded pathway for helping students stay, improve, and believe that they belong in higher education.

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

The author declares that AI-assisted writing tools were used in drafting and refining the language of this manuscript. Usage was limited to improving clarity and academic expression. The ideas, design, procedures, findings, analyses, and discussion are originally derived from the author's research.

References

Aljohani, O. (2016). A comprehensive review of the major studies and theoretical models of student retention in higher education. *Higher Education Studies, 6*(2), 1–18. https://doi.org/10.5539/hes.v6n2p1

Ashour, S. (2019). Analysis of the attrition phenomenon through the lens of university dropouts in the United Arab Emirates. *Journal of Applied Research in Higher Education, 12*(2), 357–374.

Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research, 55*(4), 485–540.

Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university*. Open University Press.

Brookfield, S. D. (2017). *Becoming a critically reflective teacher*. Jossey-Bass.

Carless, D., & Boud, D. (2018). The development of student feedback literacy. *Assessment & Evaluation in Higher Education, 43*(8), 1315–1325. https://doi.org/10.1080/02602938.2018.1463354

CAST. (2024). *Universal Design for Learning Guidelines version 3.0*. CAST.

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3–7.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.

Deci, E. L., & Ryan, R. M. (2000). The what and why of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268.

Entwistle, N. (2009). *Teaching for understanding at university*. Palgrave Macmillan.

Evans, C. (2013). Making sense of assessment feedback in higher education. *Review of Educational Research, 83*(1), 70–120. https://doi.org/10.3102/0034654312474350

Freeman, T. M., Anderman, L. H., & Jensen, J. M. (2007). Sense of belonging in college freshmen. *The Journal of Experimental Education, 75*(3), 203–220.

Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports students' learning. *Learning and Teaching in Higher Education, 1*, 3–31.

Graham, S. (2019). Changing how writing is taught. *Review of Research in Education, 43*(1), 277–303.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112. https://doi.org/10.3102/003465430298487

Jang, H., Reeve, J., & Deci, E. L. (2010). Engaging students in learning activities. *Journal of Educational Psychology, 102*(3), 588–600.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (2014). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal on Excellence in College Teaching, 25*(3-4), 85–118.

Kahu, E. R. (2013). Framing student engagement in higher education. *Studies in Higher Education, 38*(5), 758–773. https://doi.org/10.1080/03075079.2011.598505

Kahu, E. R., & Nelson, K. (2018). Student engagement in the educational interface: Understanding the mechanisms of student success. *Higher Education Research & Development, 37*(1), 58–71.

Kift, S., Nelson, K., & Clarke, J. (2010). Transition pedagogy: A third generation approach to FYE. *The International Journal of the First Year in Higher Education, 1*(1), 1–20.

Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Association of American Colleges and Universities.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Lizzio, A. (2006). *Designing an orientation and transition strategy for commencing students*. Griffith University.

McClusky, B., & Allen, B. (2023). Lessons from the Gulf: Female Indigenous Emirati students' persistence and success at university. *Student Success, 14*(1), 35–46.

Meyer, A., Rose, D. H., & Gordon, D. (2014). *Universal Design for Learning: Theory and practice*. CAST Professional Publishing.

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199–218.

Nieminen, J. H., & Pesonen, H. V. (2022). Anti-ableist pedagogies in higher education. *Teaching in Higher Education, 27*(2), 208–224. https://doi.org/10.1080/13562517.2020.1853607

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students*. Jossey-Bass.

Strayhorn, T. L. (2012). *College students' sense of belonging: A key to educational success for all students*. Routledge.

Thomas, L. (2012). *Building student engagement and belonging in higher education at a time of change*. Higher Education Academy.

Tinto, V. (2012). *Completing college: Rethinking institutional action*. University of Chicago Press.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Yorke, M., & Longden, B. (2004). *Retention and student success in higher education*. Open University Press.

Zepke, N., & Leach, L. (2010). Improving student engagement: Ten proposals for action. *Active Learning in Higher Education, 11*(3), 167–177.

Investigating the Acceptance of Using Artificial Intelligence Platforms in Students' Scientific Research: Survey From Selected Universities in Vietnam

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Abstract

The rapid advancement of artificial intelligence platforms has significantly influenced and transformed the ways in which students use and access these technologies in contemporary scientific research. This study aims to explore the acceptance of artificial intelligence platforms in scientific research among university students in Vietnam. Data were collected from 350 students and analyzed using the CB-SEM model. The survey results indicate that AI platforms have a strong impact on students' attitudes and perceptions regarding their use when conducting research or studying courses related to scientific research at universities in Vietnam. In addition, this study initially provides a reliable theoretical foundation that may support universities in implementing AI in scientific research in an effective and well-regulated manner. This may contribute to increasing acceptance of use and enabling the effective utilization of the potential of artificial intelligence in related academic activities.

Keywords: acceptance of use, artificial intelligence platforms, CB-SEM, university students, scientific research

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Introduction

In recent years, artificial intelligence (AI) has developed extremely rapidly, moving from simple data processing systems to intelligent platforms capable of supporting learners in thinking, analysis and knowledge exploration. This development has profoundly changed how people access information and use technology in everyday life, especially in higher education, where learners increasingly depend on digital tools for learning and scientific research (Wang & Lu, 2025). Recent studies show that students are the group with the highest level of access to and use of AI because of their technological adaptability and the growing need to process academic information today (Wolfe et al., 2025).

In the context of globalization and digital transformation in education, the use of AI (AI) platforms as tools to support learning and scientific research has become a common trend in many countries, especially in Vietnam (Tran et al., 2025). Many studies indicate that AI helps students improve the effectiveness of literature searching, data analysis and research idea formation, thereby contributing to the improvement of academic quality (Nasni Naseri & Abdullah, 2024). However, the level of students' acceptance and use of AI is not uniform and depends considerably on individual perceptions of benefits, ease of use and the suitability of the technology for learning and research goals (Nagy & Hajdú, 2021).

In Vietnam, the development and application of AI in higher education are being strongly promoted within the framework of national digital transformation and educational innovation. Some universities have initially encouraged students to use AI tools in learning and scientific research, especially in fields that require information processing and large scale data handling (Chung et al., 2024). Domestic studies show that Vietnamese students have relatively positive attitudes toward using AI, although concerns remain regarding the reliability, transparency and controllability of AI generated outputs (Le & Bui, 2025). This indicates the need for systematic research on students' acceptance of AI use in the current context of Vietnamese higher education (Doan, 2025; Phan et al., 2024).

To explain learners' technology acceptance and use behavior, the Technology Acceptance Model (TAM) proposed by Davis has become one of the foundational theoretical frameworks and is widely used in educational research (Davis, 1989). According to this model, learners' intention to use technology is mainly influenced by two factors, namely perceived usefulness and perceived ease of use. Subsequent studies have confirmed the effectiveness of TAM in predicting acceptance behavior toward new technologies, including AI platforms in higher education (Nasni Naseri & Abdullah, 2024).

Although TAM is a solid foundational theoretical framework, studies indicate that in the current context of rapidly expanding AI technologies with highly personalized features, a more comprehensive theoretical framework is needed to capture psychological, social and infrastructural aspects fully (Acosta Enriquez et al., 2024). In this regard, the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) emerges as an optimal tool because it not only inherits the strengths of TAM but also allows researchers to expand and add context specific factors (Wang & Lu, 2025). Based on this theoretical foundation, this study was designed and developed using the UTAUT2 model to analyze undergraduate students' acceptance of using AI platforms in scientific research in Vietnam.

The study aims to clarify the current state of students' acceptance of AI use in scientific research and to identify the influencing factors and correlations among these factors in the

present context of Vietnamese higher education. More specifically, the authors focus on answering the following two main research questions:

1. How is the acceptance of using AI platforms in scientific research among Vietnamese undergraduate students currently manifested?
2. Which factors influence AI acceptance, and how are these factors correlated?

Literature Review

Studies on AI Acceptance in Vietnam

In Vietnam, direct studies on the acceptance of Artificial Intelligence (AI) use in scientific research remain relatively scarce. Most current works focus on the application of AI in higher education, especially the use of AI chatbots in learning and academic writing. For example, recent surveys show that undergraduate students tend to evaluate positively the knowledge support role of ChatGPT in the learning process (Thai, 2023). In addition, studies on academic ethics also indicate that using AI in research entails risks related to source verification and scientific integrity (Tran et al., 2025).

Moreover, national policy documents such as the National Strategy on Research, Development and Application of AI through 2030 have created an institutional foundation for expanding AI application in scientific research and higher education (Prime Minister, 2021). However, studies that directly measure the intention and level of AI acceptance among lecturers, researchers and research groups in Vietnam have not yet been widely published, reflecting a significant academic gap in this field.

Studies on AI Acceptance in International Contexts

Internationally, the acceptance of AI use in academic activities and scientific research has been studied relatively comprehensively. Many studies rely on classical theoretical models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT or UTAUT2) to explain technology acceptance behavior in academic environments (Venkatesh et al., 2003).

A conceptual analysis based on the UTAUT2 model shows that factors such as performance expectancy, facilitating conditions and habit have a significant influence on AI acceptance in university contexts (Acosta Enriquez et al., 2024). In addition, a large scale international survey of medical researchers indicates that although AI chatbots are highly valued for their ability to support information searching, writing and research synthesis, many scientists remain cautious because of concerns about accuracy, transparency and scientific responsibility (Ng et al., 2025).

Recent studies on generative AI also emphasize the importance of balancing technological benefits with ethical issues in research, especially in ensuring the integrity and authenticity of academic results (Dwivedi et al., 2023).

The literature overview shows that the acceptance of AI use in scientific research is receiving increasing attention internationally. However, in Vietnam, the authors find that most studies have approached AI mainly through educational or policy contexts rather than focusing on researchers' intention and behavior in accepting AI use. Therefore, studying this topic in the Vietnamese context is necessary to supplement the academic gap and provide a theoretical

basis for developing policies for effective, responsible and more appropriate AI use in line with current standards of students' scientific research.

Theoretical Basis

Concept and Role of Artificial Intelligence (AI)

In the digital era, Artificial Intelligence (AI) is no longer viewed merely as a technical support tool but has become a factor that reshapes students' approaches to information and research, especially through the popularity of AI platforms such as ChatGPT and Claude. According to the definition of Dwivedi et al. (2021), AI is a computational system capable of simulating human cognitive abilities in processing data, learning from experience, recognizing patterns and making decisions based on large datasets (Dwivedi et al., 2021). From this perspective, the authors observe that AI platforms appear as an indispensable part of the research ecosystem, where deep learning algorithms and large language models (LLMs) are gradually changing how humans access, interpret and generate knowledge every day. In educational contexts, AI should be regarded as an active learning and research tool that changes how students accept the use of these platforms in scientific research within the current university environment.

Furthermore, Burger et al. emphasize that AI can function as a "digital research assistant" that supports scientists in identifying research gaps, synthesizing knowledge and processing complex unstructured datasets. This study indicates that the combination of AI's superior productivity and humans' independent critical capacity is a key condition for creating sustainable academic value (Burger et al., 2023). Similarly, Larios Soldevilla et al. (2025) demonstrate that integrating AI tools into the research process helps university learners improve productivity, literature synthesis and academic coherence while also promoting critical thinking capacity in the digital environment.

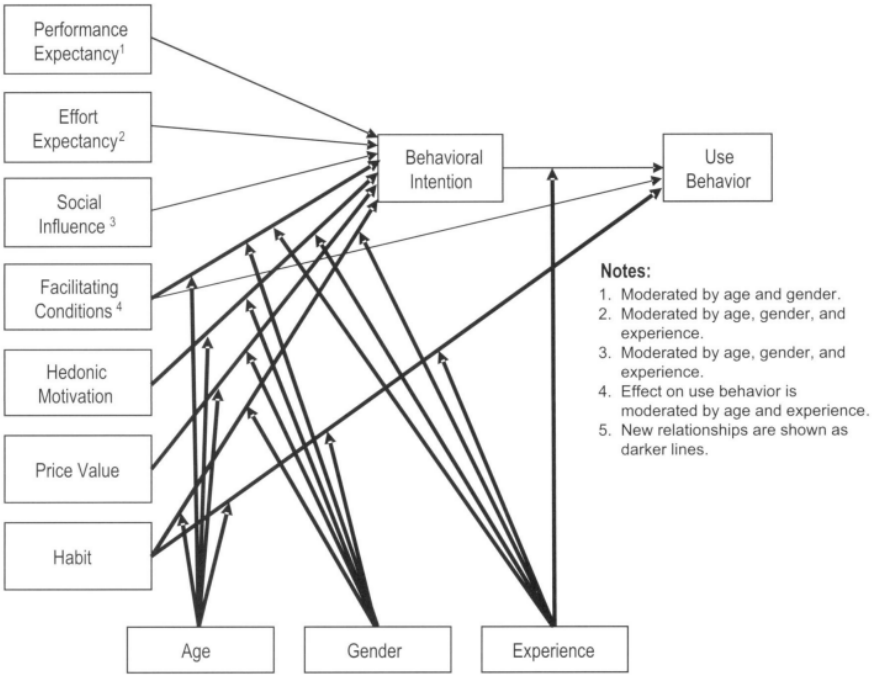
Based on the above points, AI also plays a role in optimizing processes from idea formation to the generation of results. More specifically, AI tools can automate literature review, data extraction and complex quantitative analysis, helping save time and reduce bias (Wang & Lu, 2025). In addition, Larios Soldevilla et al. state that AI helps reduce language and editorial barriers, thereby allowing researchers to focus more on creative activities and critical thinking, which are two core elements of modern scientific knowledge (Larios Soldevilla et al., 2025).

Extended Unified Theory of Acceptance and Use of Technology (UTAUT2)

To explain the psychosocial factors that influence AI acceptance behavior among researchers, especially university students, the authors argue that the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) developed by Venkatesh et al. is the most suitable theoretical framework for this topic, particularly in the current academic research context of students.

This model was developed from the original UTAUT by adding factors that reflect individual user behavior, allowing the description of voluntary behaviors and personalized experiences (Venkatesh et al., 2003). The authors believe that this is particularly suitable for the current scientific research context, where AI use is both a necessary professional need and an individual choice. Interactive components in the UTAUT2 model:

Figure 1
Research Model: UTAUT2



According to Venkatesh et al. (2012), technology acceptance is influenced by seven main factors. First, performance expectancy reflects the belief that using AI will enhance research productivity, quality and accuracy. Next, effort expectancy reflects perceived ease in operating the technology. In the AI context, this relates to the ability to learn prompt engineering skills and verify outputs (Venkatesh et al., 2012).

From a broader perspective, social influence is understood as normative pressure from the academic community and publication policies, for example, current requirements on disclosing AI use in international journals (Ganjavi et al., 2024). At the same time, facilitating conditions, including technological infrastructure, technical support and usage guidance, determine the ability to transform intention into actual use behavior.

Unlike traditional technology acceptance models, UTAUT2 adds factors that reflect intrinsic motivation such as hedonic motivation and habit, which are particularly important in academic environments where the exploration and experimentation of new tools can generate creative inspiration (Venkatesh et al., 2012).

Finally, price value reflects the balance between cost, such as subscription fees for premium AI tools, and the academic benefits generated by AI platforms, such as research productivity and output quality.

Model of Acceptance and Use of AI Platforms in Scientific Research

When the authors synthesize the theoretical perspectives and previous research findings, it can be seen that AI, especially current AI platforms based on large language models, is gradually becoming an inseparable component of scientific research activities among university students.

AI not only plays the role of a simple technical support tool but also participates directly in the process of idea formation, knowledge synthesis, data analysis and the completion of academic

products. According to the authors, accepting and using AI in research is therefore no longer a random phenomenon but the result of complex interactions among personal, social and technological factors.

In that context, the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) is considered an appropriate theoretical framework for explaining students' acceptance behavior toward AI platforms in scientific research. By integrating instrumental factors such as performance expectancy, effort expectancy and facilitating conditions, social factors such as social influence, and intrinsic motivational factors such as hedonic motivation, habit and price value, UTAUT2 allows a more comprehensive approach to AI use behavior in academic environments, where technology use is both voluntary and strongly influenced by scientific norms and future professional requirements.

From this theoretical basis, the authors argue that developing a model of acceptance of AI platform use in scientific research based on UTAUT2 is not only academically meaningful but also accurately reflects the research practices of undergraduate students in the digital era. This model not only provides a foundation for identifying factors that influence intention and behavior in AI use but also creates a premise for the empirical analyses in the following sections and contributes to proposing appropriate management and policy implications for orienting effective, responsible and sustainable AI use in higher education.

Research Methodology

In this study, the authors used a quantitative research method. The quantitative research was designed to test the model using CB SEM. In the initial stage of the study, the authors reviewed and systematized works related to AI acceptance and technology acceptance behavior in academic and research contexts, thereby forming the theoretical framework, developing hypotheses and identifying appropriate measurement scales. The authors then collected survey data from university students to evaluate the measurement model and the structural model.

Data Collection Tools

In this study, the authors used Zotero to collect, store and manage all documents for the literature review. The sources were mainly searched from academic databases and tools such as Google Scholar, ScienceDirect and other appropriate reputable academic platforms.

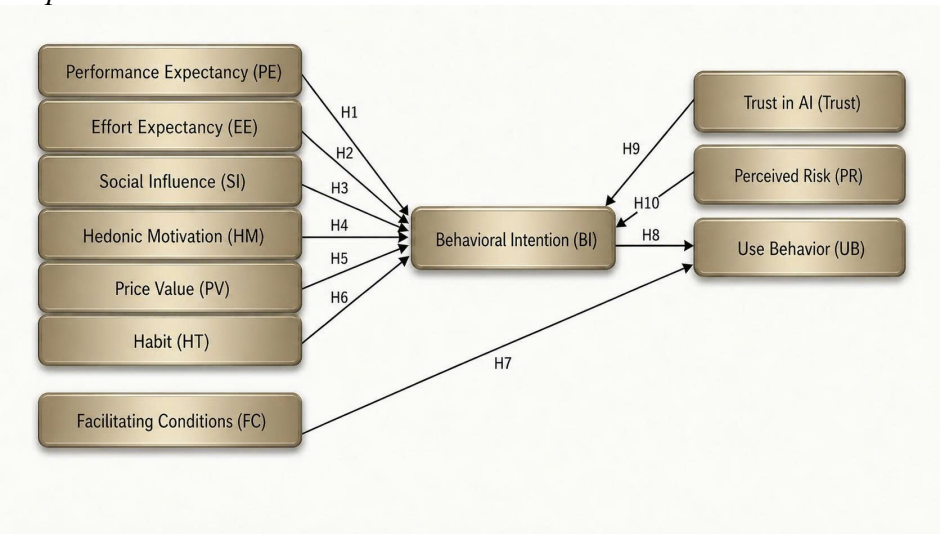
In implementation, quantitative data were collected from students through a structured questionnaire to measure acceptance level and intention to use AI platforms in scientific research activities. After collection, the data were processed using SPSS for coding, value processing, checking and descriptive statistics. Next, this study used Jamovi to run the CB SEM model. CFA was conducted to confirm the measurement scales of concepts related to AI acceptance, followed by structural model testing to assess model fit and test hypotheses about factors influencing acceptance of AI platform use in scientific research.

Research Model Framework, Proposed Hypotheses and Measurement Scale

Based on the synthesis of the theoretical foundations above, the proposed research model establishes causal relationships between the seven independent factors of UTAUT2 (PE, EE, SI, FC, HM, PV, HT) and two dependent variables, namely Behavioral Intention and Use Behavior. In this model, Behavioral Intention plays a core mediating role, reflecting the

psychological readiness of researchers before incorporating AI into the scientific process. At the same time, the model can be extended with additional context specific variables such as Trust and Perceived Risk, following the suggestion of Lai et al. (2024), in order to reflect the particular context of academic research, where integrity, responsibility and transparency are all placed at the forefront.

Figure 2
Proposed Research Model



Based on the UTAUT2 model and previous studies, this study proposes the following hypotheses:

(1) Factors influencing Behavioral Intention (BI): H1: Performance Expectancy (PE) has a positive effect on students' intention to use AI platforms in scientific research; H2: Effort Expectancy (EE) has a positive effect on students' intention to use AI platforms in scientific research; H3: Social Influence (SI) has a positive effect on students' intention to use AI platforms in scientific research; H4: Hedonic Motivation (HM) has a positive effect on students' intention to use AI platforms in scientific research; H5: Price Value (PV) has a positive effect on students' intention to use AI platforms in scientific research; H6: Habit (HT) has a positive effect on students' intention to use AI platforms in scientific research.

(2) Factors influencing Use Behavior (UB): H7: Facilitating Conditions (FC) have a positive effect on students' use behavior regarding AI platforms in scientific research; H8: Behavioral Intention (BI) has a positive effect on students' use behavior regarding AI platforms in scientific research.

(3) Factors extended according to the academic research context: H9: Trust has a positive effect on students' intention to use AI platforms in scientific research; H10: Perceived Risk has a negative effect on students' intention to use AI platforms in scientific research.

The following measurement scale was adapted to the context of students' scientific research to ensure content validity. The citation sources combine the original UTAUT2 model (Venkatesh et al., 2012) and recent academic AI studies (Dwivedi et al., 2021, 2023; Lai et al., 2024; Wang & Lu, 2025). All observed variables were measured using a five-point Likert scale (1 = Strongly disagree; 5 = Strongly agree).

Research Results

Descriptive Statistics of the Research Sample

Research data were collected from a sample of 350 undergraduate students in Vietnam. The data cleaning process showed that no observations were missing (missing = 0), ensuring the integrity of the analytical dataset.

Regarding demographic structure, the survey sample was relatively evenly distributed across gender groups, with males accounting for 54.0% and females accounting for 46.0%. In terms of year of study, most participating students were first year students (52.9%) and second year students (40.0%), while students in the third year and above accounted for a smaller proportion (7.1%). Notably, the frequency of using AI (AI) platforms in students' academic environment was very high. Up to 81.4% of students selected the highest level of use (level 5), and 10.9% reported frequent use (level 4). The detailed structure of the research sample is presented in Table 1.

Table 1
Demographic Characteristics of the Research Sample

Characteristic	Classification	Frequency (N = 350)	Percentage (%)
Gender	Male	189	54.0%
	Female	161	46.0%
Field of study	Natural Sciences	107	30.6%
	Social Sciences	104	29.7%
	Educational Sciences	120	34.3%
	Foreign Languages	19	5.4%
Year of study	Year 1	185	52.9%
	Year 2	140	40.0%
	Year 3 and above	25	7.1%
AI use frequency	Never	5	1.4%
	Rarely	6	1.7%
	Occasionally	16	4.6%
	Frequently	38	10.9%
	Very frequently	285	81.4%

Assessment of Scale Reliability and Exploratory Factor Analysis (EFA)

Before structural analysis, the reliability of the scales was tested using Cronbach's alpha. The results show that all latent constructs achieved high internal consistency. Specifically, the Cronbach's alpha coefficients of the variables far exceeded the acceptable threshold, ranging from 0.742 (Use Behavior, UB) to 0.893 (Performance Expectancy, PE, and Facilitating Conditions, FC). The item rest correlations of all observed variables were greater than 0.30, confirming that no observed variable was removed from the measurement model.

Table 2
Results of Scale Reliability Testing (Cronbach's Alpha)

Symbol	Conceptual construct	Number of observed variables	Cronbach's alpha
PE	Performance Expectancy	4	0.893
EE	Effort Expectancy	3	0.886
SI	Social Influence	3	0.864
HM	Hedonic Motivation	3	0.874
PV	Price Value	3	0.878
HT	Habit	3	0.883
FC	Facilitating Conditions	3	0.893
TR	Trust	3	0.881
PR	Perceived Risk	3	0.891
BI	Behavioral Intention	3	0.761
UB	Use Behavior	3	0.742

Next, exploratory factor analysis (EFA) was conducted using principal axis factoring and Promax rotation. The KMO (Kaiser Meyer Olkin) index reached 0.780 (greater than 0.5), and Bartlett's Test of Sphericity produced statistically significant results ($X2 = 6490$, $df = 561$, $p < .001$), confirming that the data were fully suitable for factor analysis. The extraction process produced 10 factors with cumulative variance extracted reaching 67.57%, exceeding the 50% standard.

In terms of factor structure, most observed variables loaded strongly on their corresponding theoretical factors, with factor loadings greater than 0.50. Notably, the variables belonging to Behavioral Intention (BI) and Use Behavior (UB) tended to load together on the sixth factor. This convergence often appears in technology acceptance studies at a high practical application stage, reflecting a very close relationship between intention and behavior. This structural issue was further examined through confirmatory factor analysis (CFA).

Confirmatory Factor Analysis (CFA)

The measurement model was evaluated using confirmatory factor analysis (CFA) to rigorously confirm unidimensionality, convergent validity and discriminant validity. The overall model testing results show an exceptionally ideal fit with the actual data: Chi square = 460, degrees of freedom df = 472, p value = 0.643. Since $p > 0.05$, the difference between the theoretical and actual covariance matrices was not statistically significant.

Other model fit indices also reached optimal levels compared with current academic standards: CFI = 1.00, TLI = 1.00, SRMR = 0.0310 and RMSEA = 0.000. The standardized factor loadings of all observed variables, presented in Table 3, were high, ranging from 0.672 to 0.897, and all were statistically significant at $p < .001$, with Z values ranging from 12.9 to 20.1. These results provide strong empirical evidence of convergent validity and confirm that the measurement model is fully suitable for conducting structural equation modeling (SEM).

Table 3
Standardized Factor Loadings From CFA

Latent variable	Observed variable	Standardized estimate	Z value	P value
Performance Expectancy (PE)	PE1	0.806	17.5	< .001
	PE2	0.841	18.7	< .001
	PE3	0.823	18.1	< .001
	PE4	0.822	18.1	< .001
Effort Expectancy (EE)	EE1	0.855	18.9	< .001
	EE2	0.860	19.1	< .001
	EE3	0.834	18.3	< .001
Social Influence (SI)	SI1	0.812	17.2	< .001
	SI2	0.843	18.1	< .001
	SI3	0.817	17.4	< .001
Hedonic Motivation (HM)	HM1	0.805	17.3	< .001
	HM2	0.848	18.5	< .001
	HM3	0.855	18.8	< .001
Price Value (PV)	PV1	0.897	20.1	< .001
	PV2	0.817	17.7	< .001
	PV3	0.809	17.5	< .001
Habit (HT)	HT1	0.866	19.2	< .001
	HT2	0.809	17.5	< .001
	HT3	0.863	19.1	< .001
Facilitating Conditions (FC)	FC1	0.880	20.0	< .001
	FC2	0.835	18.5	< .001
	FC3	0.859	19.3	< .001
Trust (TR)	TR1	0.885	19.9	< .001
	TR2	0.839	18.4	< .001
	TR3	0.809	17.5	< .001
Perceived Risk (PR)	PR1	0.852	19.0	< .001
	PR2	0.856	19.1	< .001
	PR3	0.858	19.1	< .001
Behavioral Intention (BI)	BI1	0.672	13.2	< .001
	BI2	0.769	15.7	< .001
	BI3	0.715	14.3	< .001
Use Behavior (UB)	UB1	0.721	13.9	< .001
	UB2	0.677	12.9	< .001
	UB3	0.698	13.4	< .001

Structural Model Testing (SEM)

The structural equation model (SEM) was used to test the research hypotheses (H1 to H10). The fit of the proposed theoretical model with the empirical data was evaluated as excellent. Specifically, X2 = 470, df = 479, p = 0.605; other indices were CFI = 1.000, TLI = 1.002, RMSEA = 0.000 and SRMR = 0.033. The SEM effect analysis table provides evidence for conclusions regarding the hypotheses:

Figure 3
SEM Path Model

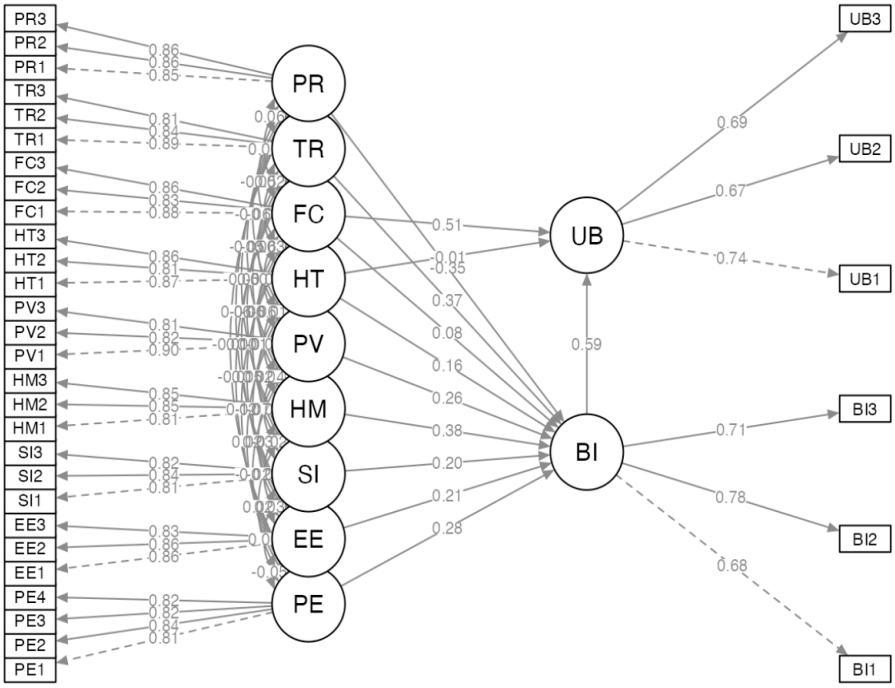


Table 4
Results of Research Hypothesis Testing (SEM Model)

Hypothesis	Structural relationship	Standardized coefficient (β)	Z value	P value	Conclusion
H1	Performance Expectancy (PE) to Behavioral Intention (BI)	0.279	5.470	< .001	Accepted
H2	Effort Expectancy (EE) to Behavioral Intention (BI)	0.211	4.278	< .001	Accepted
H3	Social Influence (SI) to Behavioral Intention (BI)	0.204	4.097	< .001	Accepted
H4	Hedonic Motivation (HM) to Behavioral Intention (BI)	0.378	6.987	< .001	Accepted
H5	Price Value (PV) to Behavioral Intention (BI)	0.257	5.160	< .001	Accepted
H6	Habit (HT) to Behavioral Intention (BI)	0.163	3.313	< .001	Accepted
H7	Facilitating Conditions (FC) to Use Behavior (UB)	0.510	8.768	< .001	Accepted
H8	Behavioral Intention (BI) to Use Behavior (UB)	0.588	8.447	< .001	Accepted
H9	Trust to Behavioral Intention (BI)	0.368	6.955	< .001	Accepted
H10	Perceived Risk (PR) to Behavioral Intention (BI)	−0.350	−6.684	< .001	Accepted

For Behavioral Intention (BI): The data show that all proposed independent factors had significant effects on the intention to use AI in scientific research. Among them, Hedonic Motivation (HM) ($\beta = 0.378$) and Trust (TR) ($\beta = 0.368$) were the two factors with the strongest positive influence. The expanded factor in the academic context, Perceived Risk (PR), served as the main barrier, with a strong and statistically significant negative effect ($\beta = -0.350$, $p < .001$) on intention to use.

For Use Behavior (UB): Actual application behavior regarding AI platforms was directly and strongly promoted by Behavioral Intention (BI) ($\beta = 0.588$, $p < .001$) and the support of Facilitating Conditions (FC) ($\beta = 0.510$, $p < .001$). Infrastructural conditions and academic support play a core role in transforming psychological intention into actual AI use behavior in students' research processes. Note that the study also recorded that FC had no statistically significant direct effect on BI, with $\beta = 0.093$, which is consistent with the original UTAUT2 theory.

Discussion

Discussion of Key Findings

This study successfully applied the extended UTAUT2 model to explain acceptance and use behavior regarding AI (AI) platforms in scientific research among undergraduate students in Vietnam. The results of structural equation modeling (SEM) confirmed the systematic nature and fit of the proposed model, while also producing several important findings specific to the academic context.

First, the central role of Hedonic Motivation (HM) and Trust. Unlike traditional educational technologies, where Performance Expectancy often occupies an absolutely dominant position, the data from this study show that Hedonic Motivation ($\beta = 0.378$) and Trust ($\beta = 0.368$) are the two factors with the strongest effects on intention to use AI. This reflects the fact that large language models, such as ChatGPT and Claude, are not merely dry computational tools but also provide intuitive interactive experiences, making the process of knowledge exploration and idea seeking less monotonous. More importantly, in the scientific research environment, trust in the quality of technological outputs is a prerequisite. When students trust that AI provides reliable information and does not reduce academic integrity, their intention to apply it increases significantly, which is fully consistent with the findings of Ng et al. (2025).

Second, the dual effect of technological perception and ethical barriers. Performance Expectancy (PE), Effort Expectancy (EE) and Price Value (PV) all have positive and significant effects on intention to use. Clearly, students perceive AI as a productivity lever that helps optimize effort from literature review to data analysis. However, the study also indicates that Perceived Risk (PR) is a significant barrier ($\beta = -0.350$). Concerns about information accuracy, namely AI hallucinations, as well as risks related to publication ethics and dependence that may erode independent critical thinking capacity, are well founded. This finding fills a theoretical gap in Vietnam regarding psychological barriers when applying AI in scientific research and confirms the view of Tran et al. (2025) regarding source verification risks.

Third, the transformation from intention into behavior. The results show that Use Behavior (UB) is directly influenced not only by Behavioral Intention (BI) ($\beta = 0.588$) but also by Facilitating Conditions (FC) ($\beta = 0.510$). Regardless of how strong students' intention is, actual

use behavior in scientific research can occur effectively only when supported by technological infrastructure and especially by legal corridors and transparent guidance from universities. This highlights the role of higher education institutions in shaping an AI use environment.

Management and Policy Implications

From the empirical results, the study proposes several important implications for higher education institutions and educational managers in Vietnam to promote the use of AI in scientific research effectively and responsibly:

(1) Developing an institutional framework and transparent guidance handbook: To minimize Perceived Risk (PR) and strengthen students' Trust, universities should urgently issue clear regulations on AI ethics in academia. This regulatory framework should define the boundary between using AI as a tool to support thinking and AI generated fraud or plagiarism. Making the citation process and reporting of the extent of AI use in articles and theses transparent will help students feel more secure when using this technology.

(2) Integrating AI literacy into training programs: Because Performance Expectancy and Effort Expectancy positively affect intention to use, universities should organize workshops and intensive training courses on prompt engineering and independent data verification skills. Helping students master technology not only increases ease of use but also eliminates passive dependence on machines.

(3) Upgrading facilitating conditions: The strong relationship between Facilitating Conditions and Use Behavior suggests that universities should consider providing legal access to licensed AI platforms, such as ChatGPT Plus and Copilot Pro, for students and researchers. This helps address the barrier related to Price Value (PV), ensures equality in technology access and thereby improves the overall quality of scientific research at educational institutions.

Research Limitations and Future Directions

Although this study contributes important theoretical and practical foundations, it still has certain limitations. First, the study used convenience sampling focused on undergraduate students; therefore, its representativeness may not fully cover the entire academic ecosystem. Second, the research data were cross sectional data, reflecting users' perceptions at a specific point in time, while AI technology is evolving at a very rapid pace.

In the future, subsequent studies could expand the survey scope to lecturers, postgraduate researchers and experts to obtain a multidimensional comparative perspective. In addition, longitudinal research models combined with qualitative analysis through in depth interviews would help decode more precisely the adaptation process and changes in the cognitive structure of researchers in response to the increasingly deep intervention of AI in knowledge production processes.

Conclusion

This study was conducted to explore and comprehensively evaluate the factors influencing the acceptance of using AI (AI) platforms in scientific research activities among students at universities in Vietnam. Based on the UTAUT2 model extended with two academic context variables, Trust and Perceived Risk, quantitative data collected from 350 students were successfully tested using covariance based structural equation modeling, CB SEM.

The empirical results confirmed the excellent fit of the proposed theoretical model with the empirical data. The study confirms that Hedonic Motivation and Trust are core factors with the strongest positive effects on students' intention to apply AI. In addition, foundational factors including Performance Expectancy, Effort Expectancy, Price Value, Habit and Social Influence all play important roles in shaping technology acceptance attitudes. In particular, the study clarified the negative effect of Perceived Risk, reflecting learners' legitimate concerns about data accuracy and issues related to academic integrity. Finally, the work demonstrates that actual AI use behavior in the research process is strongly promoted by the transformation of individual intention, together with the system of facilitating conditions regarding infrastructure and policy support from universities.

In summary, the development and presence of AI platforms are gradually reshaping how students access information, process data and create knowledge. This work not only initially fills the theoretical gap regarding AI acceptance behavior among researchers in Vietnam but also provides a reliable practical basis. Based on these findings, higher education institutions can formulate appropriate strategies, legal frameworks and training programs to maximize the potential of AI while effectively controlling risks to ensure ethical standards in academic activities.

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References

Acosta Enriquez, B. G., Ramos Farroñan, E. V., Villena Zapata, L. I., Mogollon Garcia, F. S., Rabanal León, H. C., Angaspilco, J. E. M., & Bocanegra, J. C. S. (2024). Acceptance of AI in university contexts: A conceptual analysis based on UTAUT2 theory. *Heliyon*, *10*(19), e38315. https://doi.org/10.1016/j.heliyon.2024.e38315

Burger, B., Kanbach, D. K., Kraus, S., Breier, M., & Corvello, V. (2023). On the use of AI based tools like ChatGPT to support management research. *European Journal of Innovation Management*, *26*(7), 233–241. https://doi.org/10.1108/EJIM-02-2023-0156

Chung, D. T., Thanh, N. C. M., Thu, N. V. A., Trinh, H. D., & Trinh, V. T. T. (2024). Factors affecting the behavior of using AI tools in learning among students at universities in Ho Chi Minh City. *Journal of Finance and Marketing research*, 112–125. https://doi.org/10.52932/jfm.v15i6.544

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340. https://doi.org/10.2307/249008

Doan, T. C. (2025). Using ChatGPT to support students' learning: A study at Tan Trao University. *Vietnam Journal of Education*, *25*(15), 53–58. https://tcgd.tapchigiaoduc.edu.vn/index.php/tapchi/article/view/3711

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., ... Williams, M. D. (2021). AI (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, *57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., Wright, R. (2023). Opinion paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, *71*, 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642

Ganjavi, C., Eppler, M. B., Pekcan, A., Biedermann, B., Abreu, A., Collins, G. S., Gill, I. S., & Cacciamani, G. E. (2024). Publishers' and journals' instructions to authors on use of generative AI in academic and scientific publishing: Bibliometric analysis. *BMJ*, *384*, e077192. https://doi.org/10.1136/bmj-2023-077192

Lai, C. Y., Cheung, K. Y., Chan, C. S., & Law, K. K. (2024). Integrating the adapted UTAUT model with moral obligation, trust and perceived risk to predict ChatGPT adoption for assessment support: A survey with students. *Computers and Education: AI*, *6*, 100246. https://doi.org/10.1016/j.caeai.2024.100246

Larios Soldevilla, O. A., Mendoza Ibarra, V., Urdanegui Sibina, R., Zilberman, J., Lizola Margolis, P. E., Flores Peraltilla, A. V., Herz Ghersi, J., Valencia Brenis, M., & Aviles Valdez, J. R. (2025). Adoption of AI tools and their impact on the academic research output of business school students. *Cogent Education*, *12*(1), 2556892. https://doi.org/10.1080/2331186X.2025.2556892

Le, T. T. T., & Bui, N. T. A. (2025). Acceptance of AI applications in personal finance. *Journal of Finance and Marketing research*, *16*(1), 56–69. https://doi.org/10.52932/jfm.v16i1.467

Nagy, S., & Hajdú, N. (2021). Consumer acceptance of the use of AI in online shopping: Evidence from Hungary. *Amfiteatru Economic*, *23*(56), 155–173. https://doi.org/10.24818/EA/2021/56/155

Nasni Naseri, R. N., & Abdullah, M. S. (2024). Understanding AI technology adoption in educational settings: A review of theoretical frameworks and their applications. *Information Management and Business Review*, *16*(3(I)), 174–181. https://doi.org/10.22610/imbr.v16i3(I).3963

Ng, J. Y., Maduranayagam, S. G., Suthakar, N., Li, A., Lokker, C., Iorio, A., Haynes, R. B., & Moher, D. (2025). Attitudes and perceptions of medical researchers towards the use of AI chatbots in the scientific process: An international cross sectional survey. *The Lancet Digital Health*, *7*(1), e94–e102. https://doi.org/10.1016/S2589-7500(24)00202-4

Phan, T. K., Nguyen, D. C., & Dinh, T. D. (2024). Application of AI in teaching and scientific research at universities. *Vietnam Journal of Education*, *24*(24), 14–19. https://tcgd.tapchigiaoduc.edu.vn/index.php/tapchi/article/view/2677

Prime Minister. (2021). Decision No. 127/QD TTg promulgating the National Strategy on Research, Development and Application of AI through 2030. https://vanban.chinhphu.vn/default.aspx?pageid=27160&docid=202565

Thai, T. C. T. (2023). Attitudes and expectations of English language teacher education students toward ChatGPT: A study at Hanoi National University of Education. *Vietnam Journal of Education*, *23*(10), 51–56. https://tcgd.tapchigiaoduc.edu.vn/index.php/tapchi/article/view/767

Tran, T. H., Le, T. N. T., Le, T. T. V., & Le, H. N. (2025). AI assisted references: Verification issues and ensuring integrity in scientific research in Vietnam. *Journal of Science Hanoi Open University*, 70. https://doi.org/10.59266/houjs.2025.665

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157–178. https://doi.org/10.2307/41410412

Wang, W., & Lu, Y. (2025). Survey on Chinese users' acceptance of AI assistants: Expanding technology acceptance model. *Scientific Reports*, 15, 33535. https://doi.org/10.1038/s41598-025-18123-6

Wolfe, D., Price, M., Choe, A., Kidd, F., & Wagner, H. (2025). Revisiting UTAUT for the age of AI: Understanding employees' AI adoption and usage patterns through an extended UTAUT framework. *arXiv*. https://arxiv.org/abs/2510.15142

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UXMind: An Intelligent Agent for AI-Assisted Interface Evaluation in UX Education

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Abstract

Interface evaluation methods play a central role in the field of Human–Computer Interaction (HCI), enabling the systematic analysis of usability, accessibility, and the visual organisation of interactive systems. However, applying these methods in educational contexts often requires methodological guidance and analytical experience from students. This paper presents UXMind, an intelligent agent designed to support AI-assisted interface evaluation in user experience (UX) education. The agent, available at https://danipontes.github.io/uxmind/, integrates multiple theoretical frameworks into a single web-based platform, enabling structured evaluations and the automated generation of interpretive analyses. UXMind operationalises 47 evaluation criteria derived from four widely recognised frameworks in the HCI literature: Nielsen's usability heuristics, Bastien and Scapin's ergonomic criteria, the Web Content Accessibility Guidelines (WCAG 2.1), and Gestalt principles applied to visual perception. During the evaluation process, the agent perceives the evaluation environment by collecting the scores assigned to each criterion and the qualitative observations recorded by evaluators. These data are processed by a Large Language Model (LLM) that acts as the cognitive component of the agent, enabling it to reason over usability evidence, identify evaluation patterns, and produce structured interpretations. The interpretive analysis is generated through an LLM accessed via the Groq API, a high-performance inference platform designed for low-latency execution of language models. By integrating interface evaluation frameworks with generative artificial intelligence and intelligent agent capabilities, UXMind contributes a novel approach to AI-assisted UX education, enabling scalable interface inspection practices and supporting the development of critical evaluation skills in HCI training.

Keywords: heuristic evaluation, generative artificial intelligence, HCI education, large language models (LLMs), user experience (UX)

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Introduction

The growing digitalisation of public, commercial, and educational services has established interface design as a strategic competency in the training of Information Technology professionals. The quality of user experience (UX) has become, in this context, a factor with implications that extend well beyond the commercial performance of digital products: poorly designed interfaces can function as effective barriers to access for populations with varying levels of digital literacy, motor abilities, or accessibility needs (Henry et al., 2014; W3C, 2024).

The COVID-19 pandemic, which emerged in 2020, acted as a catalyst for global digital transformation. Research by McKinsey & Company (LaBerge et al., 2020) estimated that the digitalisation of products and services was accelerated by approximately seven years as a result of the disruptions imposed by social distancing measures. This shift brought into sharp relief the relevance of interface quality, making UX a competitive differentiator of the first order (Soto-Acosta, 2020). The global UX market, valued at USD 9.96 billion in 2024, is projected to reach USD 33.19 billion by 2032 (Verified Market Research, 2025). Over the same period, the U.S. Bureau of Labor Statistics projects 8% growth in employment in web development and digital interface design between 2023 and 2033—a rate above the general occupational average. This picture is further reinforced by the finding that 71% of UX professionals believe Artificial Intelligence will transform design in the coming years, with automation and predictive design gaining increasing prominence (UXness Survey, 2024).

This context highlights the need for undergraduate Computer Science programmes to prepare professionals who are not only capable of applying interface evaluation methods, but of interpreting their findings and communicating them with appropriate technical grounding.

In the field of Human-Computer Interaction (HCI), heuristic evaluation, proposed by Nielsen and Molich (1990) and consolidated by Nielsen (1994), is widely adopted for its efficiency: it requires no direct participation of end users and allows usability problems to be identified in a systematic manner. Relying exclusively on a single framework, however, tends to limit diagnostic coverage. Cockton and Woolrych (2001) observed that different inspection methods capture distinct categories of problems and that the overlap between findings from different frameworks is only partial, suggesting the need to combine them. Added to this is the empirical evidence presented by Nielsen (1994): individual evaluators identify, on average, only 35% of an interface's problems, and the detection rate grows logarithmically with the number of evaluators, reaching approximately 75% with five specialists. These findings point to the relevance of instruments that enable the consolidation of evaluations conducted by multiple reviewers.

In parallel with this context, generative artificial intelligence (GenAI) has emerged as one of the most consequential phenomena in higher education. Systematic reviews published between 2023 and 2024 document substantial growth in the adoption of GenAI in educational settings, spanning from instructional strategies to automated assessment and feedback generation (Li et al., 2025). In the specific domain of interface evaluation, Hsueh et al. (2024) indicated that LLM-based approaches may reduce the costs of the evaluation process without compromising diagnostic quality relative to traditional methods. Zhong et al. (2025), in turn, found that synthetic LLM-based systems detected between 73% and 77% of usability problems—a rate higher than that observed among individual human evaluators, which ranged from 57% to 63%.

Despite these advances, a systematic review of GenAI integration in UI/UX workflows, covering the period from 2020 to 2025, found that the interface evaluation stage remains relatively underexplored compared to prototyping and visual generation (Kumar et al., 2025). This gap is even more pronounced in pedagogical contexts: tools that combine multidimensional heuristic evaluation, collaborative classroom dynamics, and generative AI support for HCI teaching are seldom reported in the literature.

Drawing on this diagnosis, the present work addresses the following research question: how can intelligent agents based on language models support students in learning interface evaluation in UX education, particularly with regard to the application of evaluation methods and the interpretation of their results? To answer it, this paper proposes and describes UXMind, an LLM-based intelligent agent that integrates multiple interface evaluation frameworks and generates interpretive analyses from the data collected during the evaluation process.

Literature Review

Interface Evaluation Methods

Among usability inspection methods, heuristic evaluation holds a prominent position owing to its favourable cost-to-benefit ratio (Nielsen, 1994). The ten heuristics proposed by Nielsen, Visibility of System Status, Match Between System and the Real World, User Control and Freedom, Consistency and Standards, Error Prevention, Recognition Rather Than Recall, Flexibility and Efficiency of Use, Aesthetic and Minimalist Design, Help Users Recognize, Diagnose, and Recover from Errors, and Help and Documentation, stand as the most frequently cited reference framework in usability evaluation studies published between 2010 and 2023, with applications spanning web, mobile, and virtual and augmented reality environments (Ntoa, 2025).

The ergonomic criteria of Bastien and Scapin (1993), developed at INRIA, offer a level of analytical granularity that exceeds that of Nielsen's heuristics, organising 18 criteria across eight dimensions—Guidance, Workload, Explicit Control, Adaptability, Error Management, Consistency, Significance of Codes, and Compatibility—which allows for more precise diagnosis of specific interaction problems (Nassar, 2012). The WCAG 2.1 guidelines from the W3C (2024), in turn, structure 78 success criteria around four principles—Perceivable, Operable, Understandable, and Robust (POUR)—and constitute the international technical standard for digital accessibility; their integrated evaluation alongside usability is considered indispensable in user-centred design approaches (Henry et al., 2014). The Gestalt principles (Wertheimer, 1923 as cited in Lidwell et al., 2003), finally, describe the mechanisms by which the human perceptual system groups and organises visual elements, offering evaluators conceptual tools to examine the perceptual dimension of interface design.

The combined use of these four frameworks finds empirical support in the literature: Cockton and Woolrych (2001) observed that the overlap between problems detected by distinct approaches is only partial, suggesting that evaluations conducted from multiple perspectives tend to broaden diagnostic coverage relative to the use of a single framework in isolation.

Generative Artificial Intelligence in Education

GenAI, driven by the development of Large Language Models (LLMs), has demonstrated the capacity to produce coherent and contextually situated content from natural language instructions (Brown et al., 2020). Giannakos et al. (2025) mapped four domains in which GenAI shows pedagogical potential: personalised instructional design, learning regulation, content generation, and assessment with feedback. Research in computer science education suggests that LLMs may offer feedback of comparable quality to that of human tutors in programming tasks, with the added advantage of immediate availability and scalability (Finnie-Ansley et al., 2023; Prather et al., 2024). In HCI teaching, the possibility of an LLM interpreting heuristic evaluation data and structuring technical reports may be understood as an extension of these capabilities to the interface design domain—though such a transposition is neither straightforward nor free of limitations.

The integration of GenAI in educational contexts, however, presents challenges that warrant attention. Giannakos et al. (2025) highlight concerns related to excessive student dependency, academic integrity, model bias, and data privacy. For LLM-integrated systems in HCI tools specifically, Navarro et al. (2026) recommend that studies explicitly justify the choice of model, characterise the expected behaviour of the LLM, and include technical evaluation complementary to user studies.

Digital Tools for UX/HCI Education

HCI education faces a challenge of a structural nature: it is an essentially practical discipline whose effective learning presupposes the application of theoretical concepts to real interfaces (Cockton et al., 2012). In this regard, collaborative heuristic evaluation—in which multiple evaluators examine the same interface and their findings are subsequently consolidated—tends to yield more comprehensive diagnoses than evaluations conducted individually (Hertzum & Jacobsen, 2001; Nielsen, 1994).

Tools that support this collective process, enabling the collection, consolidation, and comparison of evaluations carried out by multiple participants, present relevant potential both for professional practice and for educational contexts. Alomari et al. (2020), in proposing an evaluation framework for cyberlearning environments in computer science courses, observed that support for the practical learning of HCI methods tends to be insufficiently addressed in the design of educational tools for the field.

Methodology

This study adopts Design Science Research (DSR) as its guiding methodological paradigm. Proposed by Hevner et al. (2004, as cited in Peffers et al., 2007) in the field of Information Systems, DSR is grounded in the principle that knowledge about a problem and its possible solutions is constructed through the design and evaluation of purposefully built artefacts. Unlike the behavioural paradigm, which is oriented towards explaining existing phenomena, DSR focuses on the creation of innovations that extend human capabilities through the development of new artefacts—constructs, models, methods, or technological instantiations. The adoption of this approach is justified by the nature of the contribution proposed here: UXMind is conceived as a technological-pedagogical artefact that seeks to address the scarcity of tools capable of supporting students in learning interface evaluation in HCI courses.

The study followed the model proposed by Peffers et al. (2007), which organises the DSR process into six activities: (1) problem identification and motivation; (2) definition of solution objectives; (3) design and development of the artefact; (4) demonstration; (5) evaluation; and (6) communication.

Problem identification drew on a literature review conducted in the Scopus, ACM Digital Library, and Google Scholar databases, covering the period from 2015 to 2025, using the search terms heuristic evaluation tools, UX education, HCI teaching, and LLM usability evaluation. The analysis allowed three gaps to be identified: (a) the absence of pedagogical tools that bring together multiple heuristic evaluation frameworks within a single platform; (b) the lack of solutions that combine collaborative classroom evaluation dynamics with automatic consolidation of the data produced; and (c) the underexploration of the interface evaluation stage in studies on the integration of GenAI into UX/HCI workflows (Kumar et al., 2025).

Drawing on this diagnosis, functional and pedagogical requirements were established across three dimensions: technical (support for multiple frameworks; standardised scoring scales; data export); pedagogical (support for individual and collective evaluations; consolidation and visualisation of evaluations from multiple students; generation of interpretive analyses); and accessibility and portability (operation without installation or registration; compatibility with mobile devices; free browser-based access; multilingual support in Portuguese and English).

UXMind was developed through an iterative process comprising three refinement cycles, as recommended by DSR, incorporating feedback analysis obtained in real pedagogical contexts—namely, the User Experience (UX) Track courses of the Samsung Ocean R&D Project and the HCI course of the undergraduate Computer Science programme at the State University of Amazonas (UEA). The demonstration of the artefact took place in activities within these educational settings, in which students used UXMind to conduct heuristic evaluations of interfaces selected by the instructor. The preliminary evaluation combined static analysis of the tool's structure, descriptive evaluation based on use scenarios, and direct classroom observation. This article is therefore situated in the proposition and description phase of the DSR cycle; empirical evaluation with users and studies of pedagogical efficacy constitute the agenda for future work.

Results

Technical Architecture

UXMind's architecture is minimalist and deliberately portable. The entire application is encapsulated in a single HTML5 file, with no dependencies on external JavaScript frameworks—a decision driven by two central pedagogical requirements: reducing barriers to access and ensuring operation in contexts with limited connectivity, a recurring situation in public educational institutions in the Amazonian region. The AI analysis mechanism was implemented through integration with the Llama 3 model API via Groq, using a serverless proxy architecture hosted on the Vercel platform, which protects access credentials and enables free use in educational contexts. The generated analysis is transmitted to the user via Server-Sent Events (SSE), with a progressive typing effect. The technological components are summarised in Table 1.

Table 1
UXMind Technological Architecture

Component	Description and Function
HTML5 + CSS3 + JavaScript	Single-file application (SPA), without external dependencies. Ensures full portability and offline operation for evaluation functionalities.
GitHub Pages	Free and stable hosting with a permanent public URL, suitable for academic citation and student distribution.
Serverless Proxy (Vercel)	Intermediary between the user interface and the AI API. Protects access credentials and enables free use in the educational context.
Groq API / Llama 3 (LLM)	Language model used for the generation of interpretive analyses, with a free tier suitable for the academic context.
SSE Streaming	Server-Sent Events for real-time transmission of the analysis, with a progressive typing effect.
LocalStorage	Browser-based local storage for persistence of evaluations in Class Mode, without the need for an external database.
Internationalization (i18n)	Bilingual translation system (Portuguese/English) covering the interface, evaluation criteria, and AI prompts.

Source: Research Data.

Knowledge Base: Evaluation Criteria

UXMind's knowledge base comprises 47 evaluation criteria distributed across four scientific frameworks (Table 2). Each criterion is presented with a unique alphanumeric identifier, title, technical definition extracted from primary sources, examples of positive and negative application, and a scoring field on a scale from 0 to 4 (Poor to Excellent), with an N/A option for non-applicable criteria. The inclusion of technical definitions serves a dual pedagogical function: it guides the student throughout the inspection process and provides the LLM with the specialised vocabulary required to produce technically grounded analyses (Zhong et al., 2025).

Table 2
UXMind Evaluation Frameworks and Criteria

Framework	Criteria / Dimensions
Nielsen (1994)	10 usability heuristics: Visibility of System Status, Match with the Real World, User Control and Freedom, Consistency, Error Prevention, Recognition, Flexibility, Minimalist Design, Error Recovery, and Help.
Bastien and Scapin (1993)	18 ergonomic criteria across 8 dimensions: Guidance, Workload, Explicit Control, Adaptability, Error Management, Consistency, Significance of Codes, and Compatibility.
WCAG 2.1 — W3C (2024)	11 accessibility criteria under the POUR principles: Perceivable, Operable, Understandable, and Robust.
Gestalt (Wertheimer, 1923 as cited in Lidwell et al., 2003)	8 principles of visual perception: Proximity, Similarity, Continuity, Closure, Figure and Ground, Visual Hierarchy, Common Region, and Symmetry.

Source: Research Data.

Main Features

In the individual evaluation mode, a single evaluator navigates through the 47 criteria in an interface organised into thematic tabs, assigning scores and recording qualitative observations for each item. A global progress bar displays the percentage of criteria evaluated per framework—a feature directly related to Nielsen's Heuristic H01 (Visibility of System

Status). Upon completion, the student accesses a dashboard showing an overall weighted score, averages per framework, a map of critical criteria and strengths, and export options in CSV and TXT formats.

The Class Mode (Modo Turma) constitutes the tool's most pedagogically significant feature. Grounded in the literature on collaborative heuristic evaluation (Hertzum & Jacobsen, 2001; Nielsen, 1994) and technology-mediated collaborative learning (Dillenbourg, 1999), the mode operates as follows: (1) the instructor configures a session, defines the interface to be evaluated, and names the class group; (2) the tool automatically generates a unique link accessible to students; (3) each student conducts their evaluation independently and submits the data; (4) the responses are consolidated into a collective dashboard accessible to the instructor. This panel displays an overall average score and averages per framework, a heat map with means and standard deviations per criterion, automatic classification of critical criteria (mean ≤ 1.5), weak criteria (between 1.5 and 2.5), and strong criteria (≥ 3.0), alongside consolidated CSV export.

Table 3
Structure of the AI Analysis Prompt and Pedagogical Objectives

Report Section	Pedagogical Objective
1. Overall Interface Overview	Develop systemic vision: interpret per-framework averages as global quality indicators.
2. Identified Strengths	Reinforce good practices with reference to the corresponding framework.
3. Main Problems and Weak Points	Develop causal reasoning: describe impact on user experience with theoretical grounding.
4. Areas of Divergence (class mode)	Stimulate metacognitive reflection on inter-rater variability.
5. Improvement Recommendations	Develop propositional thinking with concrete, prioritized recommendations.
6. Conclusion	Consolidate synthesis and model technical communication of results.

Source: Research Data.

In accordance with the guidelines proposed by Navarro et al. (2026) for reporting LLM-integrated systems in HCI, UXMind includes an explicit disclaimer regarding the nature of the generated analyses: the report is positioned as an interpretive support instrument, not as a substitute for specialist judgement. Students are encouraged to treat the analysis as a starting point for discussion—a stance consistent with the limitations of LLMs documented in the literature, particularly with regard to the recognition of specific UI conventions and the identification of problems that manifest across multiple screens (Zhong et al., 2025).

Pedagogical Implications

UXMind's design draws on elements of scaffolded learning, collaborative learning, and problem-based learning. The way in which the criteria are presented operates as a cognitive scaffold: for each item, the tool provides the technical definition of the principle being assessed, concrete examples of positive and negative application, and a scoring scale with descriptive labels. This support tends to reduce the extrinsic cognitive load (Sweller, 1988) associated with the need to simultaneously retrieve and apply theoretical concepts and evaluative criteria, freeing the student's attention for the interface inspection process. The generation of AI analyses adds a second layer of scaffolding: by offering a technical

interpretation of the collected data, the system models the expected analytical reasoning—pattern recognition, articulation between evidence and theoretical principles, and formulation of recommendations (Collins et al., 1989).

The Class Mode puts into practice principles of collaborative learning (Dillenbourg, 1999): by confronting their individual evaluations with the class consensus, students encounter divergent perspectives that may give rise to constructive cognitive conflict. The standard deviation displayed on the dashboard makes inter-rater variability visible—a pedagogically relevant finding that empirically illustrates the "evaluator effect" documented by Hertzum and Jacobsen (2001). The collective analysis generated by the LLM deepens this dimension by dedicating a specific section to "Areas of Divergence Among Evaluators", offering students an interpretive model that treats inter-rater variability not as noise, but as information about the complexity of the interface being evaluated.

Considered from a broader perspective, the use of UXMind may contribute to the development of competencies relevant to UX education: by navigating the 47 criteria across four frameworks, interpreting dashboards with consolidated data from multiple evaluators, and critically discussing AI-generated reports, students practise the identification and categorisation of usability problems, the articulation between empirical evidence and theoretical principles, the synthesis of divergent perspectives, and the technical communication of results—competencies that Cockton et al. (2012) associate with the training of UX specialists.

Discussion

The results allow UXMind to be positioned in relation to the state of the art in AI-assisted heuristic evaluation tools. Two characteristics distinguish it from the approaches reported in the literature. The first concerns the division of roles between human and model: whereas Hsueh et al. (2024) and Zhong et al. (2025) propose systems in which the LLM conducts the evaluation autonomously—analysing interfaces directly from screenshots—, UXMind adopts a hybrid approach in which the evaluation is conducted by students and the LLM acts exclusively at the stage of interpreting and synthesising the collected data.

This choice is pedagogically motivated: the formative value of the tool lies precisely in the evaluation process conducted by the student, not in its replacement by AI. The second distinctive characteristic is the integration of four frameworks into a single instrument, whereas the studies by Hsueh et al. (2024) and Zhong et al. (2025) are confined to Nielsen's heuristics. This integration tends to broaden diagnostic coverage and exposes students simultaneously to multiple theoretical perspectives on interface quality—which aligns with the evidence from Cockton and Woolrych (2001) that distinct frameworks capture different categories of problems.

Three limitations of the artefact warrant acknowledgement. The first is the connectivity dependency of the AI analysis component, which restricts its use in contexts with limited internet access. The second is the absence of data persistence across sessions in Class Mode: the browser's LocalStorage retains data only within the same session and device, which prevents access to evaluations from one day to the next without prior export. The third is the inherent variability of LLM outputs: distinct executions of the same prompt may produce analyses with different emphases, limiting the reproducibility of the reports—a characteristic

documented in the literature (Navarro et al., 2026) that reinforces the pertinence of treating the generated analysis as a starting point for discussion rather than a definitive result.

Conclusion

This article presented UXMind, an intelligent agent based on language models conceived to support students in learning interface evaluation in UX/HCI education. Anchored in the Design Science Research methodological approach (Hevner et al., 2004; Peffers et al., 2007), the work proposed and described a technological-pedagogical artefact that brings together 47 evaluation criteria drawn from four consolidated scientific frameworks—Nielsen (1994), Bastien and Scapin (1993), WCAG 2.1 (W3C, 2024), and the Gestalt principles (Wertheimer, 1923, as cited in Lidwell et al., 2003)—, collaborative classroom evaluation dynamics through Class Mode, and LLM-generated interpretive analyses from the data collected during the evaluation process.

The central contribution of this work lies in an articulation that remains underexplored in the literature: the integration of multidimensional heuristic evaluation, pedagogical collaboration, and generative AI in the context of undergraduate Computer Science programmes. UXMind occupies a space identified as underexplored—the application of GenAI to the interface evaluation stage in UX/HCI workflows (Kumar et al., 2025)—with an emphasis on developing the analytical competencies of students in training. The pedagogical implications of the artefact suggest potential to support higher-order competencies in HCI—the identification and categorisation of usability problems, the articulation between evidence and theoretical principles, the synthesis of divergent perspectives, and the technical communication of results—, objectives that traditional instruments such as printed checklists or spreadsheets tend not to address in an integrated manner (Cockton et al., 2012).

Directions for Future Work

The results of this work point to three axes of future investigation. The first is the empirical evaluation of the artefact, through a controlled study comparing the pedagogical efficacy of UXMind with that of traditional methods, measuring the quality of the heuristic evaluations produced, the development of analytical competencies over the course of a semester, and student perceptions of the tool's utility and usability—for instance, through administration of the SUS (System Usability Scale). The second axis involves functional extensions: data persistence via a lightweight backend (such as Firebase or Supabase) to overcome the LocalStorage limitation; integration of multimodal analysis capability, enabling the submission of interface images to the LLM; and development of a longitudinal student progress tracking module. The third axis is expansion to other contexts: UXMind's modular architecture allows for the incorporation of additional frameworks and the adaptation of Class Mode to collaborative professional evaluation settings, such as accessibility audits in public sector organisations.

The growing demand for UX professionals in the post-pandemic market (Verified Market Research, 2025) and the progressive integration of AI into interface design workflows indicate that tools such as UXMind tend to remain relevant in the training of professionals capable of operating at the intersection of heuristic evaluation, collaboration, and artificial intelligence. This work represents an initial step in that direction.

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

The author declares that ChatGPT 5.3, an AI-based language model, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. Additionally, Claude was used as a coding assistant in the development of the UXMind.app. The author further declares that, apart from ChatGPT 5.3 and Claude, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript or developing the software. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Alomari, H. W., Ramasamy, V., Kiper, J. D., & Potvin, G. (2020). A user interface (UI) and user experience (UX) evaluation framework for cyberlearning environments in computer science and software engineering education. *Heliyon*, *6*(5), e03917. https://doi.org/10.1016/j.heliyon.2020.e03917

Bastien, J. M. C., & Scapin, D. L. (1993). Ergonomic criteria for the evaluation of human-computer interfaces. *Technical Report INRIA nº 156*. Institut National de Recherche en Informatique et en Automatique.

Brown, T., Mann, B., Ryder, N., Subbiah, M., Kaplan, J. D., Dhariwal, P., Neelakantan, A., Shyam, P., Sastry, G., Askell, A., Agarwal, S., Herbert-Voss, A., Krueger, G., Henighan, T., Child, R., Ramesh, A., Ziegler, D., Wu, J., Winter, C., Hesse, C., Chen, M., Sigler, E., Litwin, M., Gray, S., Chess, B., Clark, J., Berner, C., McCandlish, S., Radford, A., Sutskever, I., & Amodei, D. (2020). Language models are few-shot learners. In H. Larochelle, M. Ranzato, R. Hadsell, M. F. Balcan, & H. Lin (Eds.), *Advances in Neural Information Processing Systems* (Vol. 33, pp. 1877–1901). Curran Associates, Inc.

Cockton, G., & Woolrych, A. (2001). Understanding inspection methods: Lessons from an assessment of heuristic evaluation. In A. Blandford & J. Vanderdonckt (Eds.), *People and computers XV — Interaction without frontiers* (pp. 171–191). Springer. https://doi.org/10.1007/978-1-4471-0353-0_11

Cockton, G., Woolrych, A., Hornbæk, K., & Frøkjær, E. (2012). Inspection-based evaluations. In J. A. Jacko (Ed.), *The human-computer interaction handbook: Fundamentals, evolving technologies, and emerging applications* (3rd ed., pp. 1279–1298). CRC Press. https://www.taylorfrancis.com/chapters/edit/10.1201/b11963-ch-56/inspection-based-evaluations-gilbert-cockton-alan-woolrych-kasper-hornb%C3%A6k-erik-fr%C3%B8kj%C3%A6r

Dillenbourg, P. (1999). What do you mean by collaborative learning? In P. Dillenbourg (Ed.), *Collaborative learning: Cognitive and computational approaches* (pp. 1–19). Elsevier. https://telearn.hal.science/hal-00190240

Finnie-Ansley, J., Denny, P., Becker, B. A., Luxton-Reilly, A., & Prather, J. (2023). My AI wants to know if this will be on the exam: Testing OpenAI Codex on CS2 programming exercises. *In Proceedings of the 25th Australasian Computing Education Conference* (pp. 1–10). ACM. https://dl.acm.org/doi/pdf/10.1145/3576123.3576134

Giannakos, M., Azevedo, R., Brusilovsky, P., Cukurova, M., Dimitriadis, Y., Hernandez-Leo, D., … Rienties, B. (2025). The promise and challenges of generative AI in education. *Behaviour & Information Technology*, *44*(11), 2518–2544. https://doi.org/10.1080/0144929X.2024.2394886

Henry, S. L., Abou-Zahra, S., & Brewer, J. (2014). The role of accessibility in a universal Web. *In Proceedings of the 11th Web for All Conference* (Article 17, pp. 1–4). ACM. https://dl.acm.org/doi/10.1145/2596695.2596719

Hertzum, M., & Jacobsen, N. E. (2001). The evaluator effect: A chilling fact about usability evaluation methods. *International Journal of Human-Computer Interaction*, *13*(4), 421–443. https://doi.org/10.1207/S15327590IJHC1304_05

Hsueh, N.-L., Lin, H.-J., & Lai, L.-C. (2024). Applying Large Language Model to User Experience Testing. *Electronics*, *13*(23), 4633. https://doi.org/10.3390/electronics13234633

Kumar, T., Tu, X., & Zallio, M. (2025). How generative AI is reshaping UI/UX design workflows: A systematic review. *In Human factors in design, engineering, and computing* (Vol. 199, pp. 2438–2452). AHFE International. https://doi.org/10.54941/ahfe1007056

LaBerge, L., O'Toole, C., Schneider, J., & Smaje, K. (2020, October 5). *How COVID-19 has pushed companies over the technology tipping point—and transformed business forever*. McKinsey & Company. https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever

Li, B., Tan, Y. L., Wang, C., & Lowell, V. (2025). Two years of innovation: A systematic review of empirical generative AI research in language learning and teaching. *Computers and Education: Artificial Intelligence,* 9, Article 100445. https://doi.org/10.1016/j.caeai.2025.100445

Lidwell, W., Holden, K., & Butler, J. (2010). *Universal principles of design: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design* (Rev. and updated ed.). Rockport Publishers.

Nassar, V. (2012). Common criteria for usability review. *Work: A Journal of Prevention, Assessment & Rehabilitation*, v. 41, (supl. 1), 1053–1057. https://journals.sagepub.com/doi/10.3233/WOR-2012-0282-1053

Navarro, K. F., Syriani, E., & Arawjo, I. (2026). *Reporting and reviewing LLM-integrated systems in HCI: Challenges and considerations* [Preprint]. *arXiv*. https://doi.org/10.48550/arXiv.2602.05128

Nielsen, J. (1994). Enhancing the explanatory power of usability heuristics. *In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 152–158). ACM. https://doi.org/10.1145/191666.191729

Nielsen, J., & Molich, R. (1990). Heuristic evaluation of user interfaces. *In Proceedings of the ACM CHI'90 Conference on Human Factors in Computing Systems* (pp. 249–256). ACM. https://doi.org/10.1145/97243.97281

Ntoa, S. (2025). Usability and User Experience Evaluation in Intelligent Environments: A Review and Reappraisal, *International Journal of Human–Computer Interaction*, *41*(5), 2829–2858. https://doi.org/10.1080/10447318.2024.2394724

Peffers K., Tuunanen T., Rothenberger, M. A., & Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research, *Journal of Management Information Systems*, *24*(3), 45–77. https://doi.org/10.2753/MIS0742-1222240302

Prather, J., Reeves, B. N., Denny, P., Becker, B. A., Leinonen, J., Luxton-Reilly, A., Powell, G., Finnie-Ansley, J., & Santos, E. A. (2024). "It's weird that it knows what I want": Usability and interactions with Copilot for novice programmers. *ACM Transactions on Computer-Human Interaction*, *31*(1), Article 4. https://doi.org/10.1145/3617367

Soto-Acosta, P. (2020). COVID-19 pandemic: Shifting digital transformation to a high-speed gear. *Information Systems Management*, *37*(4), 260–266. https://doi.org/10.1080/10580530.2020.1814461

UXness Survey. (2024). *2024 Annual UX Tools Survey*. https://www.uxness.in/2024/06/2024-annual-ux-tools-survey-by-uxness.html

Verified Market Research. (2025). User experience (UX) market size, share & forecast. https://www.verifiedmarketresearch.com/product/user-experience-ux-market/

W3C. (2024). Web content accessibility guidelines (WCAG) 2.1. *W3C Recommendation*, 05 December 2024. https://www.w3.org/TR/WCAG22/

Zhong, R., McDonald, D. W., & Hsieh, G. (2025). *Synthetic heuristic evaluation: A comparison between AI- and human-powered usability evaluation* [Preprint]. arXiv. https://doi.org/10.48550/arXiv.2507.02306

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Mining Complex Movement Sequences to Understand Cognitive Strategies in Puzzle Solving: Integrating Computing Analytics and Psychological Insights

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Abstract

Puzzle solving behaviour represents an important domain within educational research, offering insights into cognitive strategy formation, spatial reasoning, and decision making processes during interactive learning activities. This study investigates cognitive patterns underlying problem solving performance using trajectory based sequence analysis of a 10 coin triangular puzzle exhibited at a museum. Despite the growing use of computational analytics in education, understanding cognitive processes remains challenging as outcome evaluation alone cannot capture strategy. Using behavioural interaction data collected from puzzle solving sessions, the study applies data mining and sequence analysis techniques to examine movement trajectories, coin selection frequencies, and transition structures across solving attempts. The research focuses on identifying critical early stage decisions, high frequency coin usage patterns, and terminal sequence formations that influence solution success or failure. Each coin position is treated as a discrete cognitive decision node to extract dominant behavioural pathways associated with effective or ineffective problem solving strategies. Key research areas include computational detection of critical coin transitions for modelling puzzle solving dynamics, analysis of behavioural insights in psychology oriented puzzle tasks, temporal gap analysis and behavioural pause patterns as predictors of problem solving outcomes, and sequential decision behaviour modelling in grid based cognitive tasks. Temporal cognition is examined through pause interval analysis to evaluate cognitive load variation, uncertainty resolution, and strategic reflection during interaction sequences. This interdisciplinary study contributes to educational data mining and cognitive psychology by providing a computational framework for understanding insight related problem solving behaviour, with implications for learning analytics and cognitive assessment modelling.

Keywords: cognitive study, puzzle solving, data mining, sequence analysis, behavioural analytics

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Introduction

Problem solving unfolds through sequences of decisions and actions, yet it is often evaluated only through final outcomes, which obscures the cognitive processes through which solutions emerge (Duan et al., 2025; Kim et al., 2026). This sequential reasoning is especially important in structured tasks where each move changes the problem state and shapes subsequent choices. Understanding these step-by-step processes is therefore essential for explaining how people develop effective or ineffective problem-solving strategies (Wang et al., 2023; Wang & Wieman, 2022). Puzzle-based environments provide a useful setting for examining behaviours because they combine controlled task structures with rich interaction data. These environments capture fine-grained behavioural traces, making it possible to study not only what participants achieve, but how they explore, plan, hesitate, and adapt over time (Doorn et al., 2025; Kim et al., 2026; Pusey et al., 2021). However, most existing analyses still rely on aggregate measures such as correctness or completion time, which overlook the temporal, sequential, and spatial organisation of behaviour.

Recent advances in educational data mining and learning analytics have enabled process-oriented approaches that analyse temporally ordered interaction data to reveal behavioural patterns (Duan et al., 2025; Torre et al., 2024). Sequence-based methods, including sequential pattern mining, can identify recurring action structures and transition pathways in problem-solving data (Wang et al., 2024). Despite this progress, their application to spatially constrained puzzle environments remains limited, particularly in studies that aim to link movement patterns to underlying cognitive strategies (Lieb et al., 2025).

To address this gap, this study examines problem-solving behaviour through trajectory based sequence analysis of a ten-coin triangular puzzle using interaction data collected from visitors at the Copernicus Science Centre in Warsaw. The puzzle provides a controlled environment for studying decision making, as each move alters the system state and requires sequential reasoning, spatial planning, and strategy refinement. Its constrained yet challenging structure enables systematic analysis of movement trajectories while maintaining clear interpretation of behavioural patterns.

The study contributes a computational framework that integrates data mining techniques with cognitive and psychological interpretation. By representing actions as trajectories across decision points, the framework captures the temporal, sequential, and spatial characteristics of problem-solving behaviour. This enables the identification of movement patterns, key transitions, and behaviours associated with successful and unsuccessful attempts. From an educational perspective, the approach supports deeper understanding of strategy development and provides potential applications for learning analytics, targeted interventions, and adaptive learning environments.

Literature Review

The increasing availability of digitally recorded behavioural data has led to substantial growth in computational approaches for analysing interaction sequences in problem-solving and learning environments. Rather than relying solely on outcome-based indicators such as correctness or completion time, recent research has shifted toward examining temporally ordered behavioural traces to uncover strategic regularities, transition dynamics, and latent decision pathways embedded within interaction data. This shift reflects a broader movement in learning analytics and educational data mining toward process-oriented analysis of complex

behavioural data. Within this context, sequence-based computational techniques have emerged as powerful tools for analysing ordered interaction traces. Sequential pattern mining (SPM) enables the identification of recurring behavioural structures embedded within action sequences. Unlike aggregate indicators such as action frequency or total duration, SPM preserves temporal ordering and captures local structural regularities, allowing researchers to uncover strategic pathways and behavioural motifs that characterise problem-solving processes (Lu et al., 2025). Such approaches have proven particularly valuable in examining higher-order competencies, including problem-solving and strategic reasoning.

In digital puzzle and game-based learning environments, sequence-based methods have been applied to differentiate effective and ineffective problem solvers. Wang et al. (2024) analysed ordered action sequences within a rule-based puzzle game and identified distinct behavioural patterns associated with successful performance. Their findings demonstrate that structured interaction traces can reveal meaningful differences in strategic organisation that are not observable from final outcomes alone. Similarly, Acosta et al. (2025) examined trace log data from a collaborative game-based learning environment and identified behavioural transition patterns associated with collaborative problem-solving practices and learning gains. By modelling transitions between behavioural states, their study highlights the importance of representing interaction data as temporally structured sequences when analysing problem-solving dynamics.

Sequence-based analytics have also been explored in educational puzzle contexts to support instructional insight. Gomez, et al., (2021) transformed raw gameplay logs from an educational puzzle game into interpretable behavioural sequences and developed process-oriented metrics to support classroom monitoring and feedback. While their work demonstrates the pedagogical value of sequence mining, the focus remained primarily on aggregated process indicators and error patterns rather than detailed structural movement transitions within constrained spatial configurations. Beyond game-based learning environments, computational analysis of temporally ordered behavioural data has been applied in large-scale assessment contexts. Jerez et al. (2026) employed sequential process analysis on log data from complex problem-solving assessments to identify distinct behavioural subtypes among slow responders. Their findings illustrate how analysing ordered action and pause patterns can reveal process-level differences that are not captured by aggregate performance measures. This work reinforces the importance of examining fine-grained interaction sequences to better understand heterogeneous cognitive strategies.

Process mining approaches have similarly been used to reconstruct behavioural flows from sparse event logs in training environments. Becker et al. (2022) applied process mining techniques to puzzle-based cybersecurity training data to derive behavioural process models from interaction traces. Their study highlights both the potential and the challenges of transforming low-level event data into interpretable behavioural representations in process-oriented learning tasks. Additional research has demonstrated how data mining techniques can extract semantically meaningful indicators from interactive puzzle environments. Wang et al. (2021) showed that engineered features derived from interaction log data in an interactive puzzle simulation can automate the assessment of problem-solving practices. Likewise, Liu et al. (2023) analysed log data from the puzzle-based game *Baba Is You* to characterise learning progression and extract behavioural metrics predictive of future performance. However, their approach focused on feature engineering and predictive modelling rather than examining structural movement transitions or identifying critical state transformations within constrained spatial puzzles.

Similarly, Liu & Maya (2022) integrated sequence mining and probabilistic modelling to uncover students' problem-solving phases and transition dynamics in a puzzle-based learning environment. Their findings demonstrate that temporally ordered interaction traces can reveal strategic shifts and behavioural transitions that are not visible through outcome measures alone. While these studies underscore the value of computational sequence analysis for understanding problem-solving processes, they largely emphasise phase detection, clustering, or predictive modelling rather than detailed structural analysis of movement dynamics within spatially constrained puzzles.

Spatial coin-movement puzzles such as the triangular coin puzzle have been explored primarily from a mathematical and combinatorial perspectives. (McCaffrey & Atwill , 2018) derived a general formula for determining the minimum number of coin movements required to invert triangular and related geometric arrangements. Although this study provides insight into optimal structural solutions, it does not examine the behavioural processes through which individuals attempt to solve such puzzles. The dynamic movement sequences, decision pathways, and cognitive strategies underlying human performance in spatial coin puzzles remain largely unexplored from a computational and psychological standpoint.

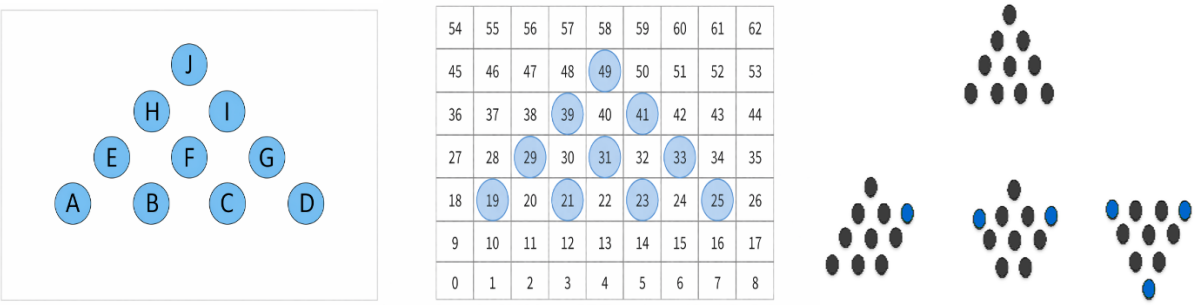
Although prior research demonstrates the value of sequence mining, process mining, and computational analytics for analysing behavioural traces in digital learning and puzzle environments, most existing studies focus on phase identification, predictive modelling, clustering, or aggregated behavioural metrics. While these approaches reveal broad behavioural patterns, they provide limited insight into the fine-grained spatial dynamics that emerge during step-by-step puzzle solving. Relatively little attention has been given to analysing detailed movement trajectories within spatially constrained puzzles, where individual actions transform the configuration of the puzzle state space. Existing studies rarely examine how the selection of specific objects, the order of movements, and spatial transitions between positions collectively shape solution pathways. Furthermore, the influence of early decision behaviour, such as first-move selection, and the role of key interactive elements in determining successful outcomes remain underexplored.

To address these limitations, the present study investigates puzzle-solving behaviour through movement sequence analysis in a triangular coin puzzle. Specifically, the study analyses individual movement trajectories, identifies common movement patterns across participants, examines first-move decision behaviour, evaluates the relationship between initial actions and problem-solving outcomes, detects key coins associated with successful solution pathways, and explores temporal gaps between movements. By integrating spatial movement analysis with behavioural and temporal insights, this work provides a deeper understanding of human problem-solving dynamics in spatial coin puzzles.

Methodology

Figure 1

Illustrates the Puzzle Representation Framework: (a) Coin Labels (A–J), (b) Grid Indexing, and (c) Movement Encoding Across Successive Puzzle



(a) **(b)** **(c)**

Panel **(a)** presents the coin labelling scheme applied to the triangular coin puzzle, in which ten coin positions are assigned alphabetical identifiers (A–J). The coins are arranged in an inverted triangular hierarchy: Coin A occupies the apex of the base row alongside Coins B, C, and D; the second row contains Coins E, F, and G; the third row contains Coins H and I; and Coin J occupies the single apex position at the top. This labelling scheme provides a standardised referencing system for recording and analysing individual coin selections across participant sessions.

Panel **(b)** presents the grid indexing system used to encode spatial positions within the puzzle state space. The physical board is represented as a two-dimensional integer grid spanning cells 0 to 62, structured across nine columns and seven rows. Each coin occupies a specific grid cell corresponding to its physical position on the board, for example, Coin A maps to cell 19, Coin D to cell 25, and Coin J to cell 49. This grid representation enables all coin movements to be encoded as ordered cell-to-cell transitions (e.g., 49→13), forming the basis for trajectory extraction, temporal gap computation, and sequential pattern mining conducted in this study.

Panel **(c)** provides a visual example of a three-step movement sequence that satisfies the puzzle objective of being solved in exactly three moves, illustrating how coin transitions are recorded across successive puzzle states. The blue-highlighted coins in each state representation denote the positions actively displaced at each step, while the remaining black coins retain their prior positions. This encoding captures both the spatial displacement and the sequential ordering of moves, enabling the reconstruction of complete participant trajectories for downstream computational analysis.

Together, these three components define the representational framework through which raw interaction data are transformed into structured movement sequences suitable for frequency mining, temporal pattern analysis, and spatial trajectory modelling.

Dataset and Preprocessing

This study draws on behavioural and self-report data generated through the Coin Puzzle Project, a ten-position triangular coin arrangement task (positions A–J). Each participant session produced a timestamped sequence of coin moves, an outcome label per move (success/unsuccessful), the elapsed time between consecutive moves, and a set of seven self-

report psychological responses: Companionship, EnjoysPuzzles, FeelInsight, FeelStuck, WayOfSolvingTheProblem, GaveUpReason, and TerminationType. Gender was also recorded across four categories. Sessions were assigned anonymised identifiers (format YYYYMMDD-XXXX). Prior to analysis, records with missing outcome labels or incomplete move sequences were excluded. All categorical psychological variables were encoded as ordinal or nominal integers appropriate to each downstream mining task.

Data Mining Methods

Frequency Mining and Descriptive Pattern Extraction

Frequency distributions were calculated across coin positions and transition pairs to identify the most common movement patterns. Consecutive moves were represented as bigrams (e.g., D→A, A→D), and the top 15 transitions were ranked by frequency to reveal dominant action sequences.

The frequent occurrence of transitions such as D→A and A→D indicates repeated movement between key positions, suggesting local search behaviour and attentional anchoring rather than globally planned strategies. This pattern aligns with cognitive load theory (Sweller, Merriënboer, & Paas, 2019), where limited working memory capacity may encourage shorter, repetitive actions instead of long term planning.

Association Rule Mining via Correlation Analysis

Pearson correlation coefficients were computed across the seven psychological self-report variables from the dataset to identify pairwise associations (Boslaugh, 2012). The correlation matrix was visualised using an interactive heatmap to explore underlying associations.

The analysis showed moderate correlations between FeelStuck and WayOfSolvingTheProblem ($r = 0.36$) and TerminationType ($r = 0.31$), suggesting that greater difficulty was linked to specific solving behaviours and unsuccessful task completion. The weak correlation between EnjoysPuzzles and FeelStuck ($r = 0.11$) indicates that puzzle enjoyment had limited influence on reducing perceived difficulty. These findings reflect psychological patterns related to fixation, persistence, and disengagement during problem solving.

Temporal Pattern Mining via TimeGap Analysis

Inter move response time (TimeGap, seconds) was analysed as a behavioural signal across coin transition pairs and visualised through a 10×10 transition heatmap. This temporal data mining approach identified timing patterns within sequential move logs by comparing successful and unsuccessful transitions.

Longer unsuccessful TimeGaps, such as B→J (9.07s) and C→J (6.25s), indicate points where participants spent more time before making incorrect moves, suggesting hesitation or misdirected reasoning. In contrast, longer successful transitions reflect deliberate processing before correct decisions, highlighting the role of reflective thinking in problem solving.

Spatial Pattern Mining via Movement Visualisation

Participant movement trajectories were mapped onto a two-dimensional coordinate space representing the triangular coin layout. Animated sequences were used to identify spatial patterns, preferred movement paths, and unusual trajectories. Key coin analysis identified the three positions most frequently linked to successful moves (1020, 1017, and 1009 occurrences), highlighting important nodes within the movement network.

The spatial analysis reflects differences in problem-solving strategies. Structured trajectories suggest stronger spatial reasoning and mental representation, while fragmented paths indicate trial and error behaviour. The concentration of successful moves around specific positions suggests that highly connected spatial locations act as intuitive anchors during puzzle solving.

Participant Profiling and Segmentation

The Movement Analysis module included a Participant Analysis view for profiling individual move sequences, outcomes, and psychological responses. Participants could be grouped by TerminationType (completed vs. abandoned) or FeelStuck ratings, enabling comparison of behavioural patterns across different solver profiles.

This data driven segmentation aligns with psychological typology research by identifying solvers with high FeelStuck scores and early termination as a distinct group characterised by lower frustration tolerance and more constrained problem-solving approaches. Mining behavioural signatures such as shorter sessions, longer per move TimeGaps, and repeated low success transitions provides empirical support for psychological profiles previously inferred only from self-reported data.

Connecting Data Mining to Psychological Analysis

The five mining operations form an integrated analytical pipeline that combines computational pattern discovery with psychological interpretation. Together, they capture multiple dimensions of problem-solving behaviour, including frequency, association, temporality, spatiality, and individual differences.

Frequency mining identifies common actions, association analysis links behaviours with psychological characteristics, temporal analysis reveals hesitation and errors, spatial analysis examines movement strategies, and segmentation highlights differences between participants. Collectively, these methods transform raw interaction logs into measurable indicators of cognitive load, fixation, insight, spatial reasoning, and frustration tolerance. The Copernicus Dashboard we have created provides the analytical interface that connects behavioural data with psychological theory, enabling a psycho-computational understanding of problem-solving processes.

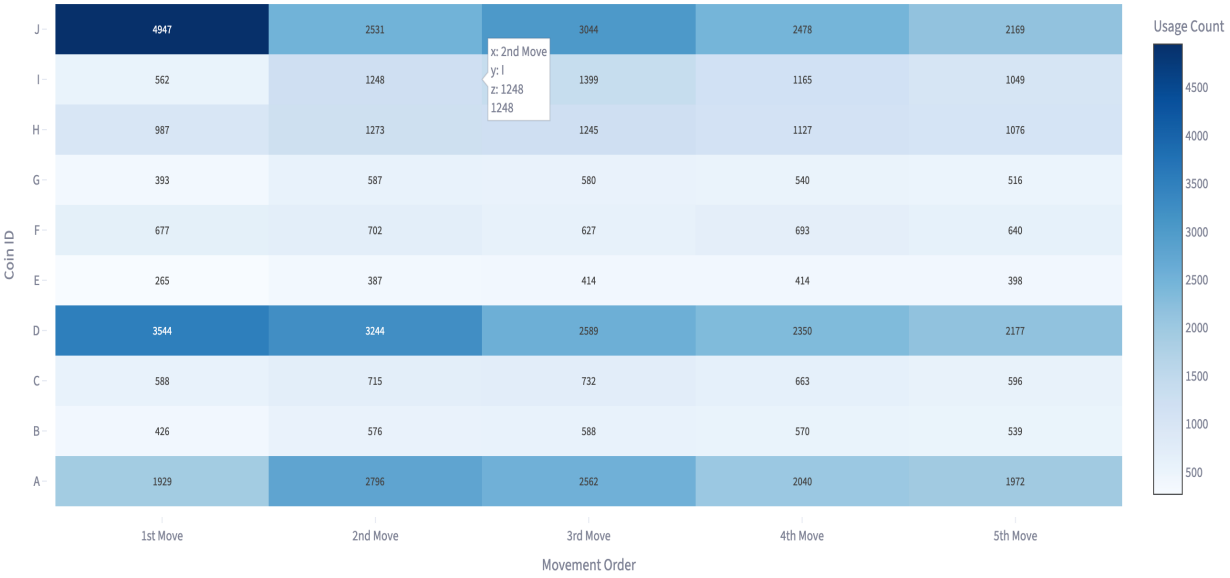
Results and Discussion

Puzzle solving behaviour is shaped not only by the frequency of individual moves, but also by the structural organisation of movement trajectories, the role of specific positions within sequences, and the relationship between spatial decisions and solution outcomes. Together, these findings provide a deeper computational understanding of how participants navigate the constrained state space of the triangular coin puzzle.

Positional Frequency Patterns in Move Sequences

Figure 2 illustrates the selection frequency of the ten coin positions (A to J) across the first five moves, with colour intensity indicating usage frequency.

Figure 2
Heatmap of Coin Usage by Movement Order (1st–5th Move)



Coin J was the most frequently selected position in Move 1 (n = 4,947) and remained highly used throughout, suggesting strong attentional focus due to its apex location in the triangular layout. Coin D showed consistently high engagement across all moves (3,544 → 2,177), indicating its role as a key navigational point in participants' solving strategies. Coin A displayed a peak at Move 2 (n = 2,796), supporting the frequent D→A transition observed in sequence analysis.

Conversely, Coins E, G, and B showed consistently low selection frequencies, suggesting reduced strategic importance during solving. Overall, the heatmap reveals a concentrated selection pattern where participants focused on a small number of high salience positions rather than exploring the puzzle space uniformly.

Per-Coin Success vs. Failure Rate Analysis

Figure 3
Success vs. Failure

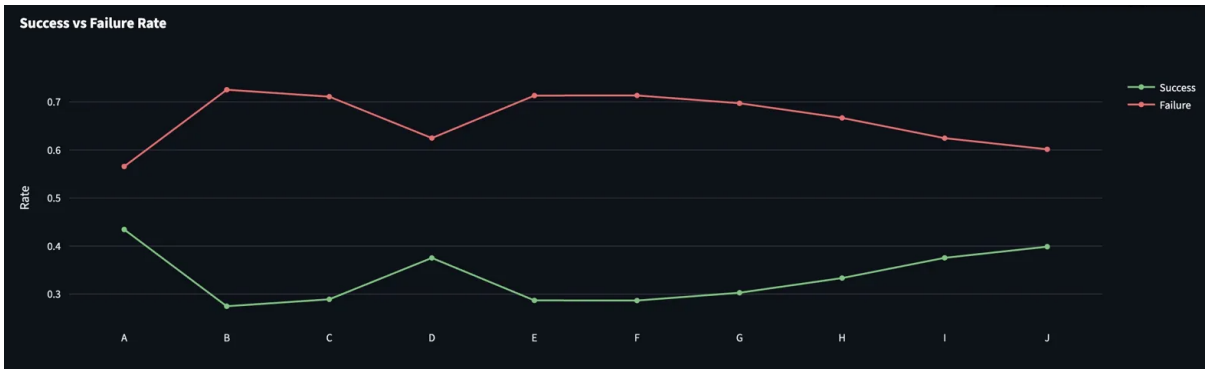


Figure 3 presents success and failure rates across the ten coin positions (A–J) using a dual line chart in the Copernicus Dashboard. Failure rates were consistently higher than success rates across all positions (approximately 0.60–0.72), indicating that unsuccessful moves were more common regardless of coin selection. Coin B showed the highest failure rate (~ 0.72) and lowest success rate (~ 0.28), while Coins A and E also demonstrated high failure rates despite frequent selection.

Coin J, the most frequently selected position (40,443 moves), achieved the highest success rate (~ 0.40) and lowest failure rate (~ 0.60), highlighting its importance in both successful and unsuccessful paths. Coins H and I showed relatively higher success rates (~ 0.33) despite lower usage, suggesting more deliberate selection. Overall, the results indicate that frequently selected positions did not always lead to successful outcomes, reflecting local heuristic search behaviour and aligning with participants' reported feelings of being stuck and trial and error strategies.

Overall Coin Movement Patterns Across Complete Puzzle Trajectories

Figure 4

Overall Frequency of Coin Movements Across Complete Puzzle Trajectories

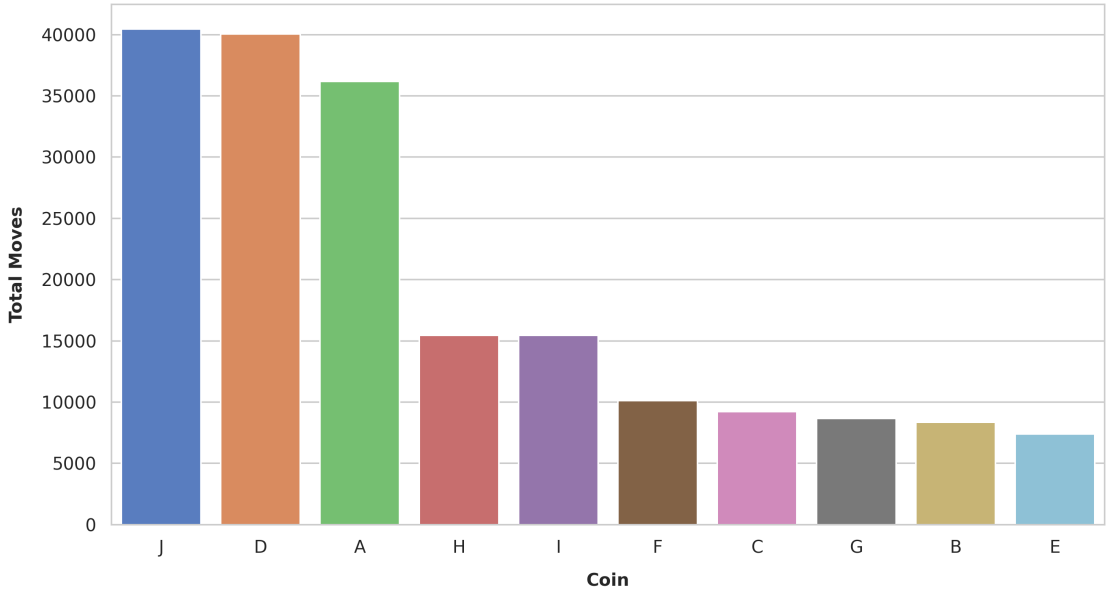


Figure 4 presents the movement frequency of each coin across all recorded puzzle trajectories. Each movement event was analysed to identify the selected coin, and occurrence counts were calculated across all sessions.

Coin J was the most frequently moved coin (40,443), followed by Coin D (40,046) and Coin A (36,169). Together, these three coins accounted for approximately 61.3% of all movements, despite representing only three of the ten positions. Coin H (15,447) and Coin I (15,443) exhibited almost identical movement frequencies, whereas Coins F (10,134), C (9,236), G (8,669), B (8,349), and E (7,399) were moved less frequently.

The concentration of movements around Coins J, D, and A indicates that participants focused on a small subset of positions during problem solving rather than exploring the puzzle space uniformly.

Strategic Solution Patterns Identified From Frequent Movement Sequences

Figure 5

Top Ten Movement Sequences Identified Through Frequency Mining, Showing Successful and Unsuccessful Puzzle Outcomes

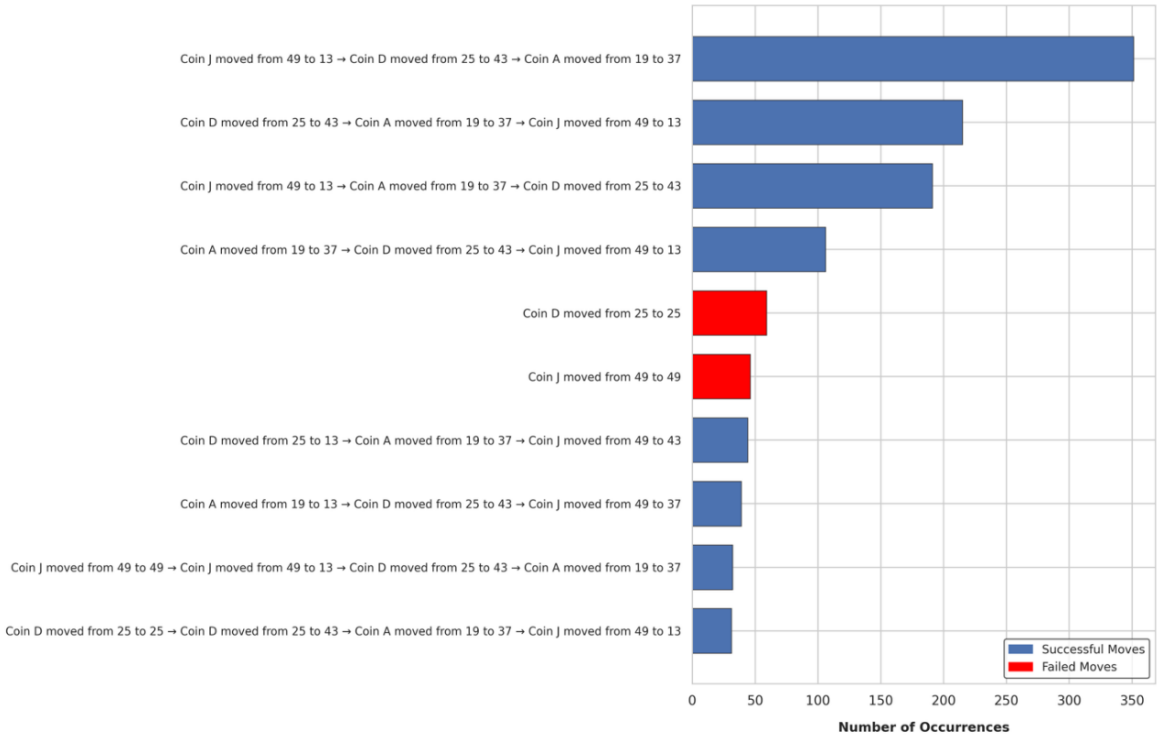


Figure 5 presents the ten most frequently occurring movement sequences identified through frequency mining of the reconstructed participant trajectories. The complete movement sequences were ranked according to their frequency of occurrence and compared across successful and unsuccessful puzzle outcomes. The final three moves within each movement sequence were then interpreted against the three predefined strategic solution patterns specified in the puzzle framework: Movement Across the Median, Rosette A, and Rosette B (Repeated Spatial Trajectories A and B).

The first four sequences followed the predefined Movement Across the Median strategy. The most frequent sequence consisted of Coin J (49→13), Coin D (25→43), and Coin A (19→37), occurring 351 times. The remaining variations of this strategy in the second, third and fourth movement sequences occurred 215, 191, and 106 times, together accounting for 863 occurrences.

The fifth and sixth sequences represented unsuccessful same position movements: Coin D (25→25), occurring 59 times, and Coin J (49→49), occurring 46 times, where no change occurred in the puzzle state. The seventh and eighth sequences matched Rosette B and Rosette A, consisting of Coin D (25→13), Coin A (19→37), and Coin J (49→43), occurring 44 times, and Coin A (19→13), Coin D (25→43), and Coin J (49→37), occurring 39 times, respectively. The ninth and tenth sequences began with same position movements before transitioning into the Movement Across the Median strategy: Coin J (49→49), occurring 32 times, and Coin D (25→25), occurring 31 times. Overall, frequency mining showed that successful movement sequences largely followed predefined strategic patterns, with movement across the median being the most dominant, followed by Rosette B and Rosette A.

Animation Example of a Successful Puzzle Solution

Figure 6

Animation of a Successful Puzzle Solution Reconstructed From Participant 20230623-0069, Showing the Sequential Coin Movements From Start to Final Solution

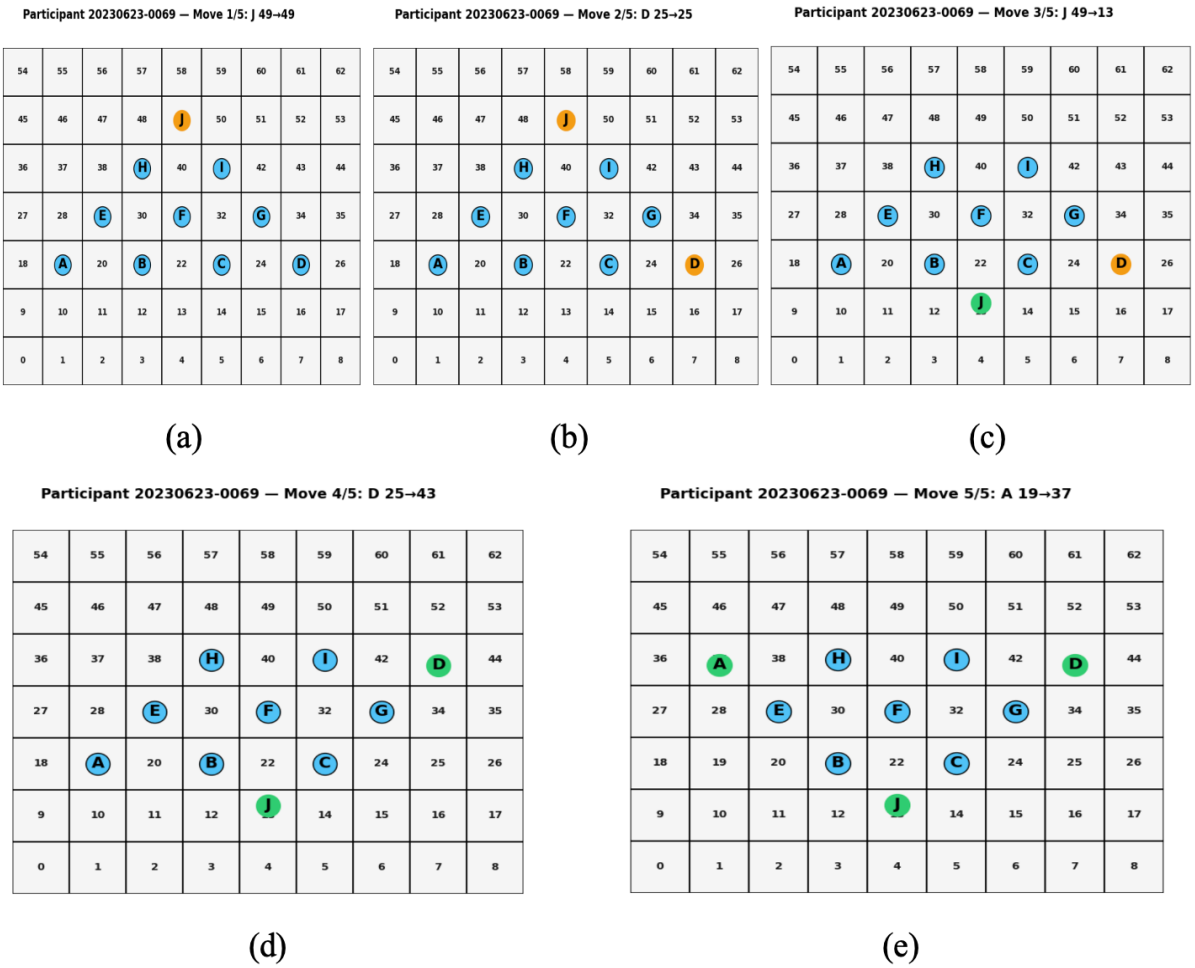


Figure 6 presents an animation example of a successful puzzle solution for participant **20230623-0069**. The animation was generated by reconstructing the participant's recorded movement trajectory and replaying each recorded coin movement sequentially to illustrate the transition from the initial board state to the successful solution. This provides an illustrative example of how a strategic solution pattern identified through the frequency mining analysis is demonstrated through an individual participant's movement trajectory.

The first two movements consist of Coin J (49→49) and Coin D (25→25). Although these movements do not alter the board configuration, they form part of the participant's complete movement trajectory before the successful solution is achieved. The remaining three movements consist of Coin J (49→13), Coin D (25→43), and Coin A (19→37). These movements correspond to the predefined Movement Across the Median strategy and result in a successful puzzle solution. The animation illustrates how the participant's trajectory progresses from the initial board configuration to the successful execution of the Movement Across the Median strategy.

Animation Example of an Unsuccessful Puzzle Solution

Figure 7

Animation of an Unsuccessful Puzzle Solution Reconstructed From Participant 20230605-0000, Showing the Sequential Coin Movements From Start to Unsuccessful Completion

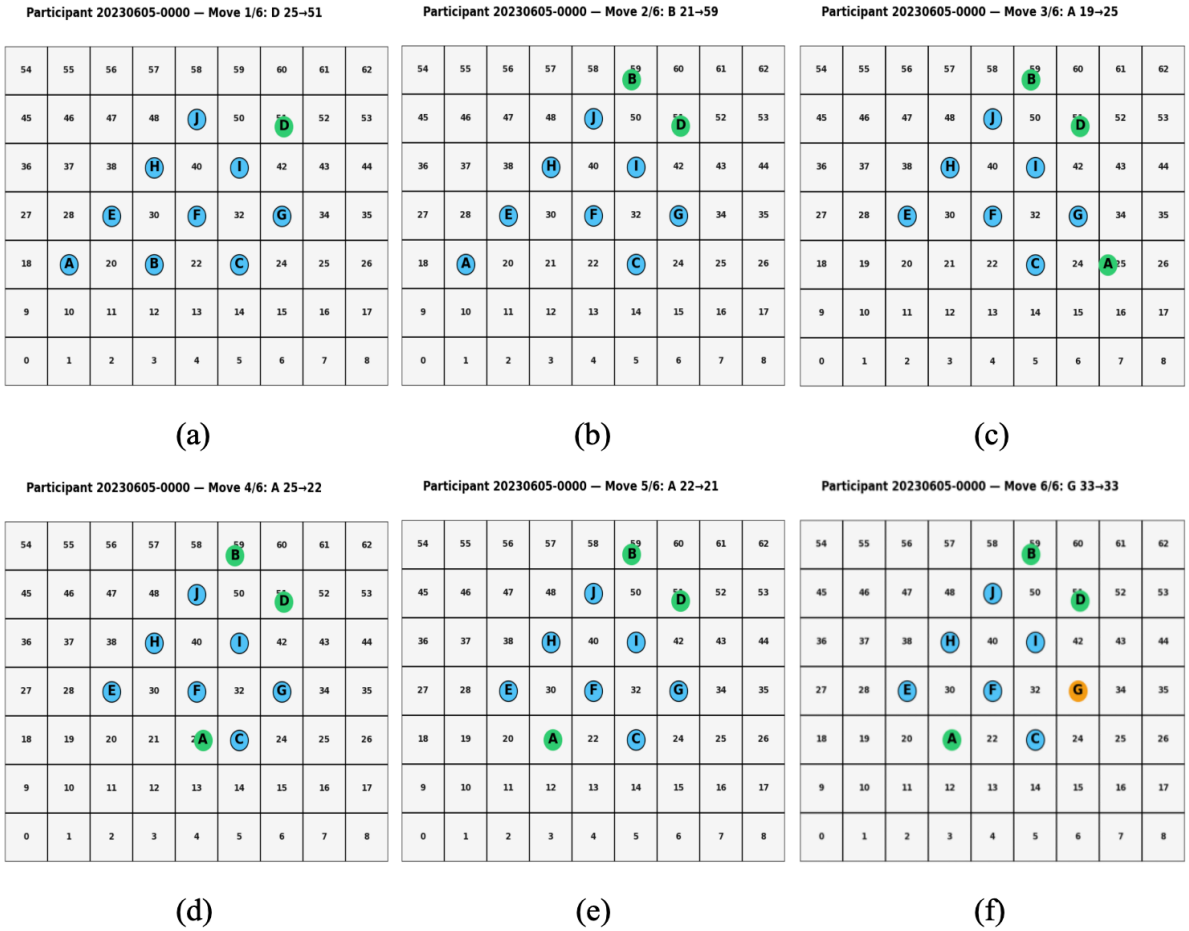


Figure 7 presents an animated reconstruction of an unsuccessful puzzle attempt by participant 20230605-0000. The recorded coin movements are replayed sequentially to illustrate the progression of the solution. Unlike successful trajectories, this movement sequence does not converge towards the strategic solution patterns identified through frequency analysis.

The participant performed six recorded movements involving Coins D, B, A, and G. The movement trajectory began with Coin D (25→51), followed by Coin B (21→59). Coin A was subsequently moved three consecutive times: Coin A (19→25), Coin A (25→22), and Coin A (22→21). The final movement involved Coin G (33→33), which did not result in any change to the board configuration.

Unlike the successful example presented in Figure 6, the movement trajectory did not terminate in any of the predefined strategic solution patterns (Movement Across the Median, Rosette A, or Rosette B) described in the puzzle framework. This animation complements the frequency mining analysis by providing a visual example of an unsuccessful movement trajectory that does not conclude with any of the recognised strategic solution patterns identified within the puzzle framework.

Figure 8

Frequency Distribution of Coin Movements Across the First Five Movement Stages

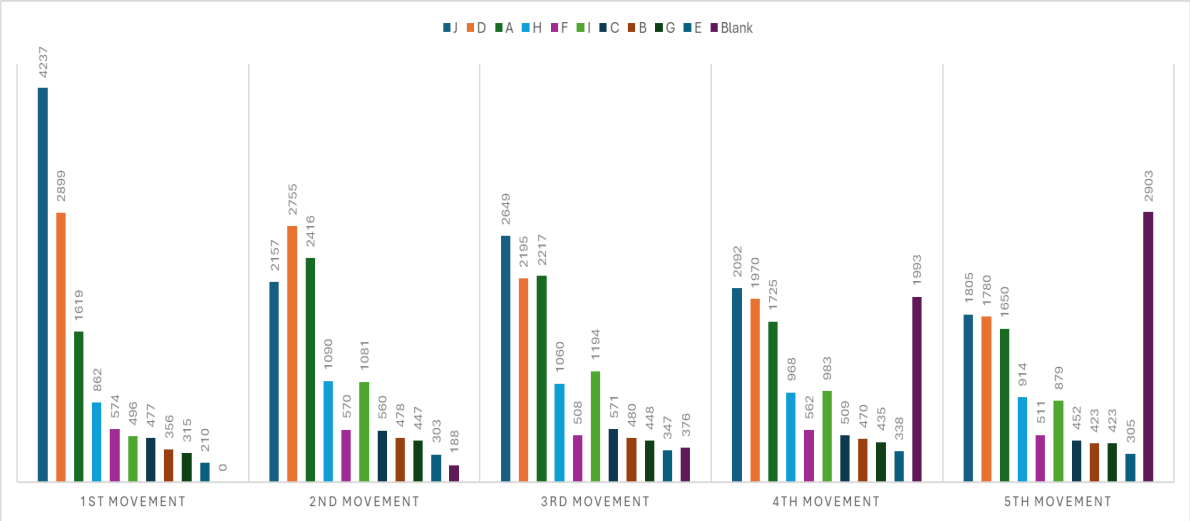


Figure 8 shows the frequency distribution of coin movements across the first five puzzle stages, highlighting participants' movement preferences and strategic choices. Coin J was consistently the most frequently moved coin, followed by Coins D and A, indicating their importance in early and intermediate solving strategies. In contrast, Coins E, G, and B showed lower movement frequencies, suggesting limited involvement during the solving process. The Blank position increased notably in later stages, particularly at Move 5, indicating a greater reliance on empty space transitions as participants explored more complex configurations. The results show a non-uniform movement pattern, with participants focusing on key coin positions while gradually shifting towards more strategic repositioning as the puzzle progressed.

The Time Gap (Pausing Time or Thinking Time) for the Coin Movements

Figure 9

The Heatmaps Compare Average Time Gaps Between Coin Movements in Unsuccessful and Successful Puzzle Attempts

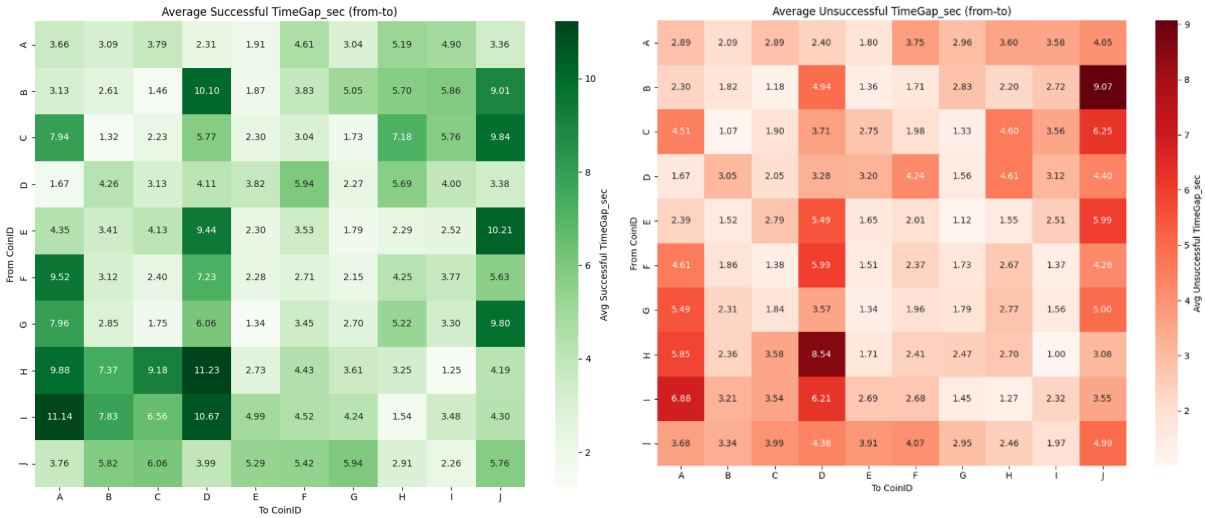


Figure 9 presents heatmaps of the average time gaps between consecutive coin movements for successful and unsuccessful sequences, with darker shades indicating longer decision times.

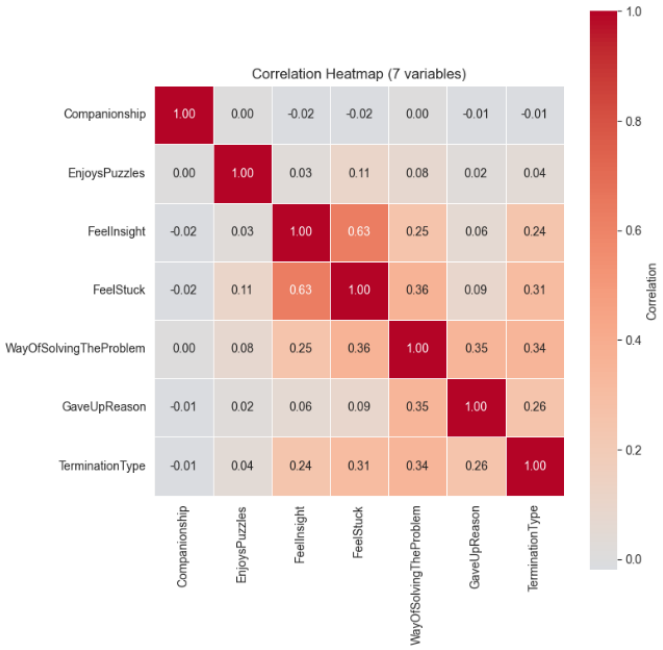
Successful movements (left green heatmap) show longer pauses for transitions such as I→A (11.14s), H→D (11.23s), and E→J (10.21s), suggesting greater cognitive consideration, while shorter gaps indicate more immediate decisions. Unsuccessful movements (right reddish orange heatmap) show longer pauses for transitions including B→J (9.07s), H→D (8.54s), and I→A (6.88s), reflecting increased uncertainty or hesitation.

Overall, the patterns suggest that pause duration provides insight into decision making processes. Rather than representing simple delays, longer time gaps may indicate deeper cognitive evaluation, while inconsistent pauses in unsuccessful attempts may reflect confusion or trial and error behaviour. These transition level patterns demonstrate how temporal analysis can reveal behavioural indicators of problem solving strategies.

The Relationships Among Seven Categorical Variables

Figure 10

Correlation Heatmap Showing the Strength and Direction of Relationships Between the Seven Analysed Variable



The correlation heatmap illustrates relationships among seven variables related to participants' puzzle solving experiences and outcomes. Most variables show weak correlations, indicating limited direct associations. The strongest positive relationship is observed between Feeling Insight and Feel Stuck (r = 0.63), suggesting that participants who experienced moments of insight also tended to report periods of difficulty. Moderate correlations were found between Feel Stuck and Way of Solving the Problem (r = 0.36), Way of Solving the Problem and Gave Up Reason (r = 0.35), and Way of Solving the Problem and Termination Type (r = 0.34), highlighting connections between emotional states, problem solving strategies, and task outcomes.

Several weaker relationships were also identified. Feeling Insight showed low correlations with Way of Solving the Problem (r = 0.25) and Termination Type (r = 0.24), suggesting that insight experiences were only partially related to strategy choice and final outcomes. Gave Up Reason showed minimal associations with Feel Stuck (r = 0.09) and Feeling Insight (r = 0.06),

indicating that reasons for stopping were not strongly linked to reported cognitive experiences. Enjoys Puzzles demonstrated consistently minimal correlations with all variables ($r = 0.00$ to 0.11), suggesting that general puzzle enjoyment had little influence on behaviour in this specific task. Similarly, Companionship showed negligible relationships across variables (approximately $r = -0.02$ to 0.00), indicating no meaningful association with puzzle solving experiences or outcomes.

Overall, the heatmap shows that while some cognitive and behavioural factors are interconnected, several personal characteristics have limited influence on solving behaviour. Combining correlation analysis with behavioural data mining provides a broader understanding of problem solving processes beyond final performance outcomes.

Conclusion

The findings highlight the potential of movement sequence analysis as an effective approach for uncovering behavioural patterns underlying problem-solving processes in spatial coin puzzles. By analysing movement trajectories, timing patterns, and decision sequences, this study demonstrates how data driven approaches can provide deeper insights beyond final solution outcomes. However, further research is required to enhance the applicability, interpretation, and educational value of this approach.

A key direction for future research is the development of real-time adaptive learning systems that can respond to learners' behaviours while a task is in progress. The identified movement and pause patterns could be used to dynamically adjust puzzle difficulty, provide personalised hints, and recommend suitable learning strategies, transforming behavioural analysis into immediate instructional support.

Future studies should also validate the approach across different puzzle types, learner populations, and educational contexts. As the current research focuses on a specific triangular coin puzzle, further investigation is needed to determine whether the observed movement patterns, first move effects, and timing behaviours represent general problem-solving strategies or are influenced by the structure of a particular task.

Additionally, future work should explore the cognitive meaning behind these behavioural indicators by examining their relationship with processes such as planning, hesitation, insight, trial and error, and strategy revision. Combining sequence analysis with complementary methods, such as eye tracking or physiological measurements, could provide deeper insights into the relationship between observable behaviours and underlying cognitive processes.

Finally, longitudinal research could investigate whether these behavioural measures can predict learning progress and the development of problem-solving skills over time. Tracking participants across multiple sessions would help determine whether improvements in movement efficiency, pause duration, and solution pathways reflect enhanced reasoning abilities and the transfer of skills to new tasks. Such developments would further establish movement sequence analysis as a valuable tool for educational assessment and personalised learning support.

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

The author declares that no AI or AI-assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Acosta, H., Hong, D., Lee, S. Y., Min, W., Mott, B. W., & Hmelo-Silver, C. E. (2025). Collaborative Game-based Learning Analytics: Predicting Learning Outcomes from Game-based Collaborative Problem Solving Behaviors. *Proceedings of the 15th International Learning Analytics and Knowledge Conference* (pp. 429–438). Association for Computing Machinery.

Becker, B. A., Quille, K., Laakso, M. J., Barendsen, E., & Simon. (2022). Process Mining Analysis of Puzzle-Based Cybersecurity Training. *Proceedings of the 27th ACM Conference on on Innovation and Technology in Computer Science Education. 1.* Association for Computing Machinery.

Boslaugh, S. (2012). *Statistics in a Nutshell, 2nd Edition.* O'Reilly Media, Inc.

Doorn, N., Vos, T. E., Marin, B., & van Diggelen, M. (2025). Puzzle-based learning for developing software testing skills. *Proceedings of the 2025 29th International Conference on Evaluation and Assessment in Software Engineering Companion* (pp. 202–212). Association for Computing Machinery.

Duan, Z., Yang, Z., Welles, B. F., & Radke, R. (2025). Beyond Utterance: Understanding Group Problem Solving through Discussion Sequences. *Proceedings of the 27th International Conference on Multimodal Interaction* (pp. 284–293). Association for Computing Machinery.

Gomez, M. J., Ruipérez-Valiente, J. A., Martinez, P. A., & Kim, Y. J. (2021). Exploring the Affordances of Sequence Mining in EducationalGames. *Eighth International Conference on Technological Ecosystems for Enhancing Multiculturality Pages* (pp. 648–654). Association for Computing Machinery.

Jerez, D., Mazzullo, E., & Bulut , O. (2026). Exploring Slow Responses in International Large-Scale Assessments Using Sequential Process Analysis. *Computers, 15*(1), 64.

Kim, S., Choi, H., Lee, S., & Kim, S. (2026). ARCTraj: A Dataset and Benchmark of Human ReasoningTrajectories for Abstract Problem Solving. *Proceedings of the 32nd ACM SIGKDD Conference on Knowledge Discovery and Data. 1*, 2687–2698. Association for Computing Machinery.

Lieb, S., Mazrek, F., & Thormählen, T. (2025). Using Interlocking Building Blocks as a Game Interface. *ACM Games: Research and Practice, 3*(3), 1–18.

Liu, H., Sun, F.-Y., Rong, F., Nakajima, K., Haber, N., & Salehi, S. (2023). Characterizing Learning Progress of Problem-Solvers Using Puzzle-Solving Log Data. *Proceedings of the 16th International Conference on Educational Data Mining* (pp. 529–533). Educational Data Mining.

Liu, T., & Maya, I. (2022). Uncovering students' problem-solving processes in game-based learning environments. *Computers & Education, 182*, 1–14.

Lu, W., Griffin, J., Laffey, J., Sadler, T. D., & Goggins, S. (2025). From In-Game Behaviors to Learning Gains: Constructing Bayesian Networks for Stealth Assessment. *Proceedings of the ACM on Human-Computer Interaction, 9*(6), 566–605.

McCaffrey, T., & Atwill, O. (2018). Inverting the 10-Coin Triangle Puzzle and Other Shapes: A New General Solution. *arXiv preprint arXiv:1810.02202*.

Pusey, M., Wong, K. W., & Rappa, N. A. (2021). he puzzle challenge analysis tool. A tool for analysing the cognitive challenge level of puzzles in video games. *Proceedings of the ACM on Human-Computer Interaction. 5*, 1–27. Association for Computing Machinery.

Torre, M. V., Oertel, C., & Specht, M. (2024). The Sequence Matters in Learning - A Systematic Literature Review. *Proceedings of the 14th Learning Analytics and Knowledge Conference* (pp. 263–272). Association for Computing Machinery.

Wang, K. D., Cock, J. M., Käser , T., & Bumbacher, E. (2023). A systematic review of empirical studies using log data from open-ended learning environments to measure science and engineering practice. *British Journal of Educational Technology, 54*(1), 192–221.

Wang, K. D., Liu, H., DeLiema, D., Haber, N., & Salehi, S. (2024). Discovering Players' Problem-Solving Behavioral Characteristics in a Puzzle Game through Sequence Mining. *Proceedings of the 14th Learning Analytics and Knowledge Conference* (pp. 498–506). Association for Computing Machinery.

Wang, K. D., Salehi, S., Arseneault, M., Nair, K., & Wieman, C. (2021). Automating the Assessment of Problem-solving Practices Using Log Data and Data Mining Techniques. *Proceedings of the Eighth ACM Conference on Learning* (pp. 69–76). Association for Computing Machinery.

Wang, K. D., & Wieman, C. E. (2022). Applying Sequence Mining to Explore Students' Problem-solving Practices Using an Interactive Simulation-based Task. *Proceedings of the 16th International Conference of the Learning Sciences* (pp. 433-4439). International Society of the Learning Sciences.

Zhang, C., Kemp, C., & Lipovetzk, N. (2024). Human Goal Recognition as Bayesian Inference: Investigating the Impact of Actions, Timing, and Goal Solvability. *arXiv preprint arXiv:2402.10510*.

The Lost Children: Re-engaging Adolescent Literacy Through Structured Intervention, Relational Pedagogy, and the Identity of Success

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Abstract

Adolescent literacy presents a significant educational challenge, with many students entering secondary schooling with persistent reading difficulties and low academic self-efficacy. This paper presents the experience and findings of a literacy intervention specialist who developed a structured literacy intervention designed to address both skill acquisition and learner engagement. The program is informed by the Science of Reading (Castles et al., 2018), multisensory structured language instruction (Birsh, 2018), and research on explicit instruction, feedback, and engagement (Hattie, 2023). A key pedagogical feature is the deliberate emphasis on what is described within the program as an "identity of success," whereby instruction is structured to ensure students experience frequent, visible success and errors are reframed as part of learning. This relational teaching approach is intended to reduce anxiety and support engagement. This paper reports practitioner-collected data from 101 students over a ten-year period. Of these, 91.5% achieved reading mastery and 84% achieved combined reading and spelling mastery, with most requiring approximately 40 or more hours of instruction. The cohort included a high proportion of students with diagnosed learning differences, including Specific Learning Disorder (SLD), Attention-Deficit/Hyperactivity Disorder (ADHD), and Autism Spectrum Disorder (ASD). Ongoing longitudinal follow-up confirms students have achieved success in a range of post-school pathways including tertiary study, vocational training, and employment. The paper argues that structured literacy approaches, when combined with relational pedagogy and repeated experiences of success, can improve engagement and literacy outcomes for adolescent learners. For students who have internalised an identity of academic failure, these changes represent a substantial shift in confidence, agency, and educational participation. Ultimately, teaching is not only about what is taught, but how learning is experienced and who the learner becomes as a result.

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Introduction

Across Australia and internationally, adolescent literacy remains a significant and unresolved educational challenge. The persistence of low adult literacy rates in Tasmania which is the context for this paper, suggests that many struggling readers are not transient educational casualties but individuals who carry unresolved literacy difficulties across their lifespan. While many education systems have improved awareness of early literacy instruction and the importance of explicit phonics teaching, students continue to enter secondary school unable to read fluently enough to independently access curriculum content. For these students, literacy difficulty becomes cumulative. The gap between their decoding and comprehension capacity and the increasing linguistic complexity of secondary curriculum materials widens each year.

In Australia, national assessment data consistently demonstrates that a significant proportion of students fail to achieve expected literacy standards during the middle years of schooling (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2024). Tasmania in particular continues to report literacy outcomes below the national average across multiple domains and year levels. These outcomes are reflected not only in academic performance, but also in school attendance, disengagement, behavioural dysregulation, early school leaving, and long-term social participation.

The consequences of literacy failure extend beyond academic underachievement. Literacy has been widely recognised as foundational to civic participation, employment, autonomy, and social inclusion. UNESCO has described literacy as a "fundamental human right" and an essential condition for lifelong learning and participation in society (Wagner, 2011). When students progress through schooling without functional literacy, they are effectively excluded from full participation in education and life itself.

The cohort included 101 students ranging from upper primary to secondary age. 85% of students presented with diagnosed or imputed learning differences, including:

- Specific Learning Disorder (SLD)/dyslexia
- Attention-Deficit/Hyperactivity Disorder (ADHD)
- Autism Spectrum Disorder (ASD)
- language processing difficulties
- histories of school disengagement or interrupted attendance

Participants represented a diverse range of educational experiences and levels of literacy difficulty. A significant challenge for adolescent learners is that literacy difficulty is rarely experienced as an isolated academic issue. By secondary school, many struggling readers have already internalised repeated experiences of failure. They may see themselves as incapable learners, avoid literacy tasks, or disengage from schooling altogether. In this context, intervention requires more than technical instruction alone. It also requires a relational pedagogy capable of rebuilding confidence, agency, and willingness to engage in learning.

This paper explores the intersection of structured literacy intervention and relational pedagogy through a practitioner-developed intervention program delivered over a ten-year period in Tasmania. The paper argues that literacy intervention for adolescents must address both the cognitive dimensions of reading acquisition and the emotional and relational dimensions of learning identity. It further argues that teaching should be understood not simply as content delivery, but as a practical and relational craft in which learners' experiences of success play a central role in educational re-engagement.

This practitioner-collected data from a ten-year literacy intervention delivered in Hobart, Tasmania involved 101 adolescent learners with persistent reading difficulties. The study adopts a practice-based research design using literacy assessment records, instructional observations, and longitudinal follow-up data to examine the relationship between structured literacy instruction, relational pedagogy, and learner engagement. While the findings are practitioner-generated rather than derived from a controlled experimental design, they provide valuable evidence regarding literacy outcomes and educational re-engagement within a Tier 3 intervention context.

I developed and delivered the literacy intervention, working primarily with adolescent learners who had persistent reading and spelling difficulties. Many participants had previously received other forms of educational support without achieving functional literacy.

I can not claim universal causation, but can present practice-based findings and observations that may contribute to broader discussions about adolescent literacy intervention, engagement, and teacher practice.

Several limitations must be acknowledged.

The findings presented are practitioner-generated and do not constitute controlled experimental research. The study lacks:

- randomised sampling
- independent assessment measures
- control groups
- standardised longitudinal tracking

As such, outcomes cannot be generalised broadly or interpreted as definitive evidence of causation. Nevertheless, practitioner evidence remains valuable in educational contexts, particularly where formal research concerning adolescent literacy intervention remains comparatively limited.

The Science of Reading and Structured Literacy

Over the past two decades, a substantial body of evidence has emerged regarding the cognitive processes involved in reading acquisition. Often described collectively as the "Science of Reading," this research draws from cognitive psychology, linguistics, neuroscience, and education to examine how reading develops and how reading difficulties can be effectively addressed.

Castles, Rastle, and Nation (2018) argue that effective reading instruction requires explicit and systematic teaching of phonemic awareness, decoding, fluency, vocabulary, and comprehension. Reading is not a naturally acquired process in the same way as oral language; rather, it depends upon the development of specific neural and linguistic pathways that must be explicitly taught for many learners.

Structured literacy approaches align closely with this evidence base. Structured literacy is characterised by explicit, systematic, cumulative instruction in phonology, orthography, morphology, syntax, and semantics (International Dyslexia Association, 2019). Instruction is sequenced carefully, with concepts taught directly and reinforced through cumulative review

and guided practice. For adolescents the sequence needs to give them faster access to multisyllabic words to reflect what is being presented in curriculum standard content.

For students with dyslexia and related literacy difficulties, explicit structured instruction has repeatedly demonstrated stronger outcomes than less systematic or discovery-based approaches (National Reading Panel, 2000). Importantly, the principles underlying structured literacy are not limited to early childhood. Older struggling readers continue to require explicit instruction in foundational skills when those skills have not been consolidated in to secondary school.

Neuroscience

Neuroscience perspectives highlight that adolescence is a period of heightened neuroplasticity and incomplete executive control, meaning that educational failure during this window does not merely result in skill deficits, but may also shape behavioural trajectories through altered stress regulation, reward sensitivity, and self-control capacity (Landowski, public neuroscience lectures).

Adolescence is a critical period of neurological development, with the prefrontal cortex—the region responsible for executive functions such as planning, impulse control, decision-making, and self-regulation—continuing to mature well into early adulthood (Blakemore, 2018). During this time, behaviour is more strongly influenced by the limbic system, increasing sensitivity to reward, emotion, and environmental stress. Consequently, adolescents experiencing persistent literacy failure and school disengagement are at a time when the neural systems of executive control remain under construction. Contemporary neuroscience also demonstrates that the adolescent brain retains considerable neuroplasticity; neural pathways are strengthened through repeated use, while those that are not activated become less efficient (Blakemore, 2018; Wolf, 2018). Reading mastery develops through repeated, explicit, and structured practice that gradually establishes automatic neural pathways for decoding and language processing. The cognitive architecture that needs to be built is the same if you are learning to read at 5 or 15. The difference is that adolescents have sensitivity to reward, emotion, and environmental stress (Shulman et al., 2016).

Multisensory Structured Language Instruction

Multisensory Structured Language Instruction (MSLI) incorporates visual, auditory, kinesthetic, and tactile modalities into literacy instruction. Birsh (2018) argues that multisensory approaches support memory consolidation and engagement, particularly for adolescent students with language-based learning difficulties.

Although multisensory teaching alone is not sufficient without explicit structure and sequence, it can strengthen student participation and reduce cognitive overload for learners who have experienced repeated difficulty. In adolescent contexts, multisensory instruction may also assist in reducing avoidance and increasing willingness to engage with literacy tasks.

The KSE Adolescent Literacy Program draws conceptually from multisensory structured language traditions associated with Orton–Gillingham-informed practice, while integrating relational pedagogy and adolescent engagement strategies. This study's intervention consisted of a 100-lesson structured literacy sequence designed for adolescent learners incorporating:

- systematic phonics instruction

- phonemic awareness
- morphology and word study
- spelling instruction
- cumulative review
- diagnostic assessment
- fluency practice
- multisensory teaching techniques

The intervention also placed strong emphasis on relational continuity, consistency, and emotional safety within learning interactions.

Adolescent Literacy and Learner Identity

Adolescent literacy intervention differs from early intervention in important ways. Older struggling readers frequently present with a combination of academic skill deficits, accumulated frustration, low self-efficacy, and school disengagement. Many have experienced years of perceived failure before intervention occurs.

Research on self-efficacy suggests that repeated experiences of success are central to the development of learner confidence and persistence (Bandura, 1997). Hattie (2023) similarly identifies feedback, visible progress, and clarity of success criteria as significant influences on educational achievement.

For adolescent learners, literacy intervention therefore involves both instructional precision and relational trust. Students who perceive themselves as incapable often require opportunities to experience competence in small, visible, and achievable increments.

This aligns with Freire's (1970) argument that education is fundamentally relational and connected to human agency. Literacy is not simply the acquisition of technical skills; it is also connected to identity, participation, and empowerment. Those young people who enter the justice system are not only socially marginalised but educationally abandoned long before offending occurs. A Victorian Parliament speech recounts the case of "Tom," a 15-year-old who left school unable to read, write, or even spell his own name (Heath, 2023).

Relational Pedagogy and Educational Engagement

So educators in this space need to turn their attention to relational pedagogy which emphasises the role of connection, trust, emotional safety, and mutual respect within learning environments. For students with histories of academic struggle, relational teaching approaches reduce anxiety and increase willingness to persist through challenge.

Within the intervention discussed here, relational pedagogy is not separate from explicit instruction, but as the emotional and interpersonal framework that allows explicit instruction to become effective. Many adolescent learners presenting for intervention have experienced repeated educational failure, behavioural correction, exclusion, or embarrassment around literacy tasks. Consequently, the intervention intentionally seeks to eliminate anticipatory anxiety through predicatability which in turn increases psychological safety. This is what makes the Tier 3 space crucial. In Tier 3, there are no witnesses, no judgement, no comparisons.

A key practical feature of this approach involves suspending conventional behavioural-management responses where possible in favour of acceptance and regulation support. Learners within the cohort presented with ADHD, ASD, trauma histories, anxiety, or language-processing difficulties. Some demonstrated behaviours such as fidgeting, pacing, hand-flapping, avoidance, delayed response time, or difficulty retrieving information quickly from memory need to be accepted. Rather than interpreting these behaviours as non-compliance, the intervention approach treated them as part of the learner's regulatory profile. Students were permitted movement, processing time, sensory regulation strategies, and prompting without reprimand. This approach sought to separate literacy difficulty from shame and behavioural escalation.

Language itself also formed an important part of the relational pedagogy. The intervention relied upon highly consistent instructional scripting and predictable lesson structures. Inclusive collective pronouns such as "we" were used intentionally:

"This is what we know…"
"Last time we were here…"
"I'm going to say some words…."
"This is everything we know so far…."
"How do you write the sound…"
"Have another go at this one…"
"Nothing is a test — it is just practice."

The repetition and scripted nature of the instructional language served several purposes. First, it reduced cognitive and emotional uncertainty by making lessons highly predictable. Students knew how sessions would begin, what sequence would follow, and how sessions would conclude. Second, it provided cognitive cueing, allowing students to prepare for participation in different sections of the lesson. Third, the use of collective language positioned learning as collaborative rather than evaluative. Fourth, it builds new neural pathways that create automaticity that leads to fluency. It is not boring it is predictable.

The intervention also deliberately avoided adversarial testing language and public correction. Errors were reframed as expected parts of learning rather than evidence of failure.

A recurring phrase stated in every lesson within the intervention was: "If you can correct it, it is correct."

This phrase reflected a broader pedagogical principle: that success should remain accessible even after error. Students were consistently guided toward correction through reminders of explicitly taught concepts and scaffolded prompts. One example of this is intentionally ignoring letter reversal.

The intervention additionally relied upon very high rates of encouragement, affirmation, and visible markers of success with tangible rewards. The student response booklets provide tangible proof to the student that they have progressed and are learning. Praise was intentionally concrete and immediate. Students regularly received written affirmations such as "100% correct" or "A+", alongside tangible reinforcement including stickers, tokens, or treats. This was found to work with all ages including adults.

While these strategies may appear simple, their purpose was deliberate. Many learners entering intervention had experienced years of perceived academic inadequacy. The intervention

therefore attempted to construct what became known in practice as an "identity of success", where students repeatedly experienced themselves as capable participants in learning. Success is something you need to try on. Often a learner will not actually know what it feels like.

I argue that explicit instruction and relational pedagogy should not be viewed as oppositional frameworks. In public debates about literacy instruction, there can sometimes be a false dichotomy between explicit teaching and relational or student-centred approaches. However, in practice, adolescent intervention requires both. Explicit instruction provides clarity, structure, and cognitive scaffolding. Relational pedagogy provides emotional safety, trust, and willingness to persist. For adolescent learners who have experienced repeated failure, these dimensions are deeply interconnected.

This aligns with Bandura's (1997) work on mastery experiences and self-efficacy, as well as Hattie's (2023) findings regarding the significance of teacher-student relationships, feedback, clarity, and visible success in educational achievement.

Professor Pamela Snow has similarly argued that effective literacy instruction requires both explicit teaching and strong teacher knowledge regarding oral language, decoding, vocabulary, and language development. As she puts it in the title of her lecture "The Reading Crisis we can fix". She frames literacy as a social justice issue. Snow contends that literacy failure is not simply an inevitable consequence of disadvantage or neurodiversity, but often reflects insufficiently explicit instruction and delayed intervention (Knowledge Society, 2023).

Social Justice

The relationship between literacy and social justice has also been examined through sociological perspectives on educational inequality. Literacy has been described as a fundamental human right and a prerequisite for full participation in society (Annan, 2003; Wagner, 2011). Persistent literacy failure represents not only an educational problem but an issue of equity and social inclusion. Van Krieken et al. (2022) argue that educational institutions can contribute to the reproduction of social inequalities when some students in our society to not have access to "the elaborate code of language" which facilitates higher order thinking. Drawing on the work of Bernstein and Bourdieu, they suggest that schools often reward forms of communication and cultural knowledge from the elaborate code, students with middle-class backgrounds. Consequently, students who begin school without access to these forms of cultural capital can experience cumulative educational disadvantage. "Literacy is a bridge from misery to hope" (Van Krieken et al., 2022). Relational pedagogy can therefore be understood not only as a teaching strategy but also as an equity practice by giving a student an identity of success through access to the elaborate code.

The concept of an "identity of success" therefore reflects the intersection of instructional design, emotional safety, engagement, learner identity and social equity.

Data Collection

Data was collected through my practitioner records including:

- lesson records
- literacy assessment data
- reading and spelling mastery outcomes
- attendance and participation observations

- longitudinal follow-up communication where available

The limitations of practitioner-generated data must be acknowledged. The study did not include a control group, randomisation, or independent external assessment measures. As such, findings should be interpreted cautiously as practice-based evidence rather than generalisable causal research.

Practitioner-collected data indicated that:

- 91.5% of students achieved reading mastery within the intervention framework
- 84% achieved combined reading and spelling mastery
- most students required 40 or more hours of intervention instruction

While outcomes varied according to learner profile and complexity of need, all students demonstrated substantial growth following sustained intervention.

Conclusion: Engagement and Confidence

One of the strongest themes emerging from my observations, was the relationship between literacy success and learner identity.

Many students entered intervention presenting with high levels of anxiety, avoidance, or resignation around reading tasks. Some openly described themselves as “stupid,” “bad at reading,” or incapable of learning.

As students experienced repeated success through structured and scaffolded instruction, they demonstrated increased willingness to attempt unfamiliar tasks, improved persistence, and greater participation in learning.

Although these observations are qualitative rather than formally measured psychological outcomes, they suggest that literacy intervention influences broader educational engagement when students begin to experience themselves as capable learners.

The Lost Children described in this paper were never incapable of learning. Years of unsuccessful educational experiences had taught them that they were unsuccessful learners. While structured literacy provided the instructional pathway to reading, it was the deliberate construction of an Identity of Success that enabled many students to re-engage with learning. Through repeated mastery experiences, relational consistency, explicit teaching, and predictable success, students gradually replaced narratives of failure with identities of success. This suggests that effective adolescent literacy intervention is not solely concerned with teaching students to read. It is equally concerned with helping them believe that they can.

Furthermore, my findings suggest that adolescent literacy intervention involves more than remediation of technical reading deficits alone, literacy difficulty often becomes intertwined with identity. For these learners, successful intervention may depend partly upon whether instruction creates opportunities for students to experience themselves differently as learners. The concept of an “identity of success” emerged from practical teaching experience and formal psychological theory. When students experience repeated correction without humiliation, visible progress, and achievable success, they re-engage not only with literacy tasks, but with education more broadly.

If we accept that literacy failure is not merely an academic deficit, but an identity-forming experience that impedes a person's participation in life, then we must step up and find a way. I found a way and here it is: a Tier 3, structured, multisensory literacy program, delivered through an appropriately accelerated, cumulative sequence, using relational pedagogy to provide an intentional experience of tangible success.

Adolescent literacy remains one of the most significant unresolved equity issues in education.

Ultimately, it is not just what you teach. It is how you teach it — and who that person becomes as a result. The Lost Children can be found.

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

In accordance with IAFOR's policy on the ethical use of artificial intelligence, I acknowledge the use of OpenAI's ChatGPT during the preparation of this paper. The tool was used in refining the structure and clarity of writing, improving grammar and style, and providing feedback on draft sections. All scholarly judgement, critical analysis, interpretation of evidence, and conclusions are my own. I reviewed, edited, and verified all AI-assisted content and take full responsibility for the accuracy and integrity of the final submission.

References

ACARA. (2024). *NAPLAN national results*. Australian Curriculum, Assessment and Reporting Authority.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.

Birsh, J. R. (2018). *Multisensory teaching of basic language skills* (4th ed.). Paul H. Brookes Publishing.

Blakemore, S.-J. (2018). *Inventing ourselves: The secret life of the teenage brain*. Doubleday.

Castles, A., Rastle, K., & Nation, K. (2018). Ending the reading wars: Reading acquisition from novice to expert. *Psychological Science in the Public Interest, 19*(1), 5–51.

Freire, P. (1970). *Pedagogy of the oppressed*. Continuum.

Hattie, J. (2023). *Visible learning: The sequel*. Routledge.

Heath, R. (2023, February 8). *Literacy education*. *Parliament of Victoria, Legislative Council, Parliamentary Debates (Hansard).* https://www.parliament.vic.gov.au/parliamentary-activity/hansard/hansard-details/HANSARD-974425065-20079

International Dyslexia Association. (2019). *Structured literacy: Effective instruction for students with dyslexia and related reading difficulties*.

Knowledge Society. (2023, September 25). *Pamela Snow | Effective literacy instruction is essential to overcoming disadvantage* [Video]. YouTube. https://www.youtube.com/watch?v=VJi7hoE8lJE

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. National Institute of Child Health and Human Development.

Shulman, E. P., Smith, A. R., Silva, K., Icenogle, G., Duell, N., Chein, J., & Steinberg, L. (2016). *The dual systems model: Review, reappraisal, and reaffirmation*. *Developmental Cognitive Neuroscience, 17*, 103–117. https://doi.org/10.1016/j.dcn.2015.12.010

Sutton, K. (2024). *Katrina Sutton Education Adolescent Literacy Program.*

Van Krieken, R., Habibis, D., Smith, P., Hutchins, B., Haralambos, M., Holborn, M., & Chapman, S. (2022). *Sociology: Themes and perspectives* (7th Australian ed.). Pearson Australia.

Wagner, D. A. (2011). What happened to literacy? Historical and conceptual perspectives on literacy in UNESCO. *International Journal of Educational Development, 31*(3), 319–323.

Wolf, M. (2018). *Reader, come home: The reading brain in a digital world*. Harper.

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Fostering Teacher-Student-Parent Relationships Through Hands-On Learning: A No-Screen Approach to Early Literacy

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Abstract

This multi-case study explores the impacts of a screen-free approach to direct literacy instruction that utilizes the Science of Reading framework and is supplemented by hands-on, screen-free educational games at home. While digital literacy tools increasingly proliferate in early childhood classrooms, early literacy skills benefit deeply from distraction-free, personal student-teacher connections. The study is grounded in relational pedagogy, which is vital for young students during this rapid phase of brain development. These meaningful connections foster their well-being, care, and empathy. Using a mixed-methods design in an urban school district in the northeastern United States, this study analyzed summative student literacy assessments alongside descriptive findings from semi-structured interviews with teachers and parents. Local and national data from neighboring districts were used for comparison. Following the thematic analysis, the results demonstrated a positive correlation between screen-free instruction and reading achievement. Qualitative themes also revealed strong home-school partnerships, improved communication, and deeper mutual connectedness of community members. Ultimately, these findings suggest that a low-tech and high-touch approach better equips students to maintain or exceed grade-level reading expectations throughout elementary school and beyond.

Keywords: early literacy, screen-free direct instruction, relational pedagogy, home-school partnerships

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Introduction: Background and Purpose

Parents, caregivers, and early childhood educators serve as the primary facilitators of child development. When these stakeholders adopt a collaborative, team-based approach to early literacy—creating interactive, engaging, and hands-on learning environments—they profoundly shape a child's future academic success. By employing a multisensory approach at school, paired with screen-free reinforcement at home, adults can cultivate highly meaningful, distraction-free learning experiences. Specifically, by focusing on the Science of Reading framework and explicitly instructing the six pillars of literacy—oral language, phonemic awareness, phonics, fluency, vocabulary, and comprehension—through game-based and tactile activities, educators and families can maximize student engagement. Furthermore, replacing screen-based instruction with dedicated, one-on-one adult attention not only strengthens interpersonal relationships but also fosters a lifelong love of reading. As screens increasingly permeate both homes and classrooms, understanding their impact on early childhood development is critical. Therefore, this study aimed to expand upon this vital body of research by examining the tangible benefits of screen-free, relational literacy instruction.

Framework

The theoretical framework grounding this study is primarily informed by relational pedagogy (Noddings, 2013) and Vygotsky's (1978) social development theory. Relational pedagogy highlights the critical role of supportive, collaborative relationships between students, teachers, and families (Noddings, 2013). By fostering a unified, team-based approach to early literacy, this framework supports student development through structured social interactions, including collaborative peer learning, individualized student-teacher engagement, and parent-led game-based learning activities at home.

Closely aligned with the relational foundation, Vygotsky's (1978) social development theory asserts that cognitive growth and language acquisition are inherently social processes. Within this model, teachers and family members serve as the "more knowledgeable other" (MKO) who provide critical instructional scaffolding within the child's zone of proximal development (ZPD). Rather than being isolated with digital screens, students in this study engaged in dialogue and tactile learning with attentive adults, directly supporting Vygotsky's premise that early literacy and language skills work collaboratively together through meaningful human interactions.

Methods & Data Source

Research Methods

This study employed a mixed-methods, multi-case study design. Participation was entirely voluntary for all participating families and educators. This study took place in an urban school in the northeastern United States that utilizes a strictly screen-free approach to early literacy instruction.

Data Collection

Data collection was conducted in three distinct phases to allow for the triangulation of quantitative student metrics, qualitative perspectives, and comparative local and national data.

Quantitative Student Assessment Data

With written parental consent, classroom teachers provided summative pre- and post-assessment student literacy data for the focus students (N = 2). This data consisted of criterion-referenced benchmark assessments from their district's adopted Houghton Mifflin Harcourt (HMH) literacy curriculum. These benchmarks served as the primary individual intervention trackers to measure discrete skill acquisition and mastery over the course of the screen-free instructional period.

Qualitative Interviews

To capture the lived experiences and insights of key stakeholders, semi-structured interviews consisting of 10 open-ended questions were conducted with participating teachers and family members. These interviews inquired about observed student literacy progress, current instructional and home methodologies, the strength of home-to-school partnerships, and participant reflections on the quantitative student assessment data.

Comparative Institutional, State, and National Data

To establish a rigorous comparative baseline, institutional-level data were obtained from local and national sources. First, the target school provided school-wide, end-of-year norm-referenced proficiency rate data utilizing the NWEA MAP (Measuring Academic Progress) growth assessment. This nationally normed metric established the broader academic achievement baseline of the target school.

End-of-year NWAE MAP proficiency data was also obtained from a neighboring school located in close geographic proximity. This neighboring school served as an ideal comparison group, as it shared nearly identical demographics regarding student-teacher ratios, proportions of students with disabilities, multilingual learners, and students from low socioeconomic backgrounds. Furthermore, while both schools utilized the same HMH literacy curriculum, the comparison school integrated digital screens into its early literacy instruction, whereas the target school utilized a screen-free approach.

To contextualize student performances within state-level expectations, the state learning assessment, NJSLA, was referenced as a norm-based metric. Statewide averages for third-grade English Language Arts (ELA) typically serve as the primary benchmark for early elementary literacy. Since this formal testing does not begin until the third grade, NWEA MAP Linking Study was referenced to bridge the gap and be a predictive metric. Nationally, reports from the National Center for Educational Statistics (NCES) were used to evaluate state-level standards, allowing for a comprehensive comparison of individual student achievements against local, state, and national performance metrics.

Data Analysis

Qualitative interviews were transcribed and systematically analyzed using MAXQDA software to identify, code, and categorize emerging themes. Quantitative pre-and post-assessment data scores were then analyzed and compared against the student data in their own school, in a neighboring school, and national averages to evaluate the overall efficacy of the screen-free literacy instructional approach.

Methodological Notes on Data Metrics

While this study utilized multiple assessment types that measure achievement through different statistical lenses, they are integrated within a structured, multi-layered framework. Specifically, national and state norm-referenced data (NAEP and NJSLA) establish the macro-level educational landscape, while school-wide NWEA MAP Growth percentiles provide a meso-level norm-referenced comparative baseline. Since formal state testing (NJSLA) does not begin until third grade, NWEA's NJ Linking Study is referenced to statistically project early childhood MAP performance towards future state-level proficiency rates (NWEA, 2025). In contrast, the HMH curriculum benchmarks serve as a micro-level, criterion-referenced trackers designed to isolate and measure the individual acquisition of target skills under the screen-free, high-touch instruction. Triangulating these distinct macro, meso, and micro metrics allows the study to evaluate localized student mastery while contextualizing individual growth within state and national achievement standards.

Participants & Setting

School Setting

The study was conducted within a public school district in the northeastern United States, purposely selected due to its implementation of a screen-free, hands-on approach to direct literacy instruction aligned with the Science of Reading framework. The focal school serves students from pre-kindergarten to fourth grade, with a total enrollment of approximately 429 students. The school maintains a 10:1 student-teacher ratio. Demographically, 18% of the student population are classified as students with disabilities, 12% are multilingual learners, and 8% of students are receiving financial assistance during the academic year of the study.

Participant Selection

Through convenience sampling, two families and two kindergarten teachers from the same school community volunteered to participate. Because the families' children were assigned to different homerooms, the participant group consisted of two distinct parent-teacher-student triads.

- Case 1 (Student A): A Caucasian female kindergarten student who is currently classified as a multilingual learner. The case includes Student A's parents (2) and homeroom teacher (1).
- Case 2 (Student B): A Caucasian female kindergarten student who received academic support under her Individualized Educational Program (IEP). The case includes Student B's parents (2) and homeroom teacher (1).

Results

Quantitative Student Literacy Progress

At the beginning of the school year, pre-assessment data revealed that the two focus students entered kindergarten with vastly different levels of English language proficiency and foundational literacy skills. Over the course of the academic year, both students received direct screen-free literacy instruction. Summative pre- and post-assessments evaluated student development across key early literacy domains, including oral language, phonics, phonemic awareness, vocabulary, fluency, and comprehension.

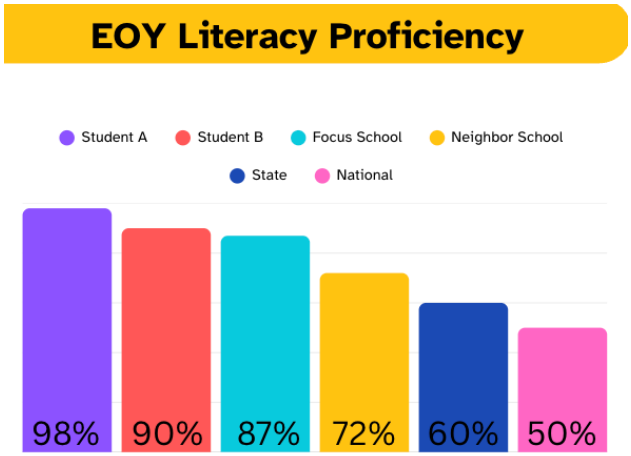
To measure progress, teachers utilized standardized rubric criteria based on benchmark assessments from their literacy curriculum to calculate proficiency rates. Both students demonstrated substantial, clinically significant academic growth from the beginning of the year (BOY) to the end of the year (EOY).

- Student A (Multilingual Learner): Demonstrated a 39% increase, improving from a pre-assessment proficiency rate to a post-assessment proficiency rate of 98%
- Student B (IEP Support): Demonstrated a 50% increase, improving from a pre-assessment proficiency rate to a post-assessment proficiency rate of 90%

Comparative Analysis

To evaluate the efficiency of the screen-free instructional mode, the focus students' end-of-year (EOY) proficiency rates—derived from their curriculum-based benchmarks—were compared against school-wide, local, state, and national data points.

Figure 1
End-of-Year Literacy Proficiency Rates of Student A, Student B, the Focus School, Neighbor School, the State, and the Nation



As illustrated in Figure 1, both individual case study students exceeded the overall EOY literacy proficiency rate of their own school, as well as the neighboring school's EOY proficiency rate by a margin of 15%. Furthermore, when analyzing institutional performances independent of pedagogical modalities, both localized schools outperformed broader state and national standards (NCES, 2025; NWEA, 2025).

Specifically, the screen-free focus school (87%) and the screen-integrated neighboring school (72%) both exceeded the state proficiency average of 60% and national norm-referenced median baseline of 50%. This tiered comparison indicates that while both local schools are high-performing, the focus school's screen-free approach with their pedagogical model, achieved the highest overall tier of academic success, which is mirrored in individual mastery of the two focus students.

Interviews

To capture the lived experiences of the participants, semi-structured interviews were analyzed. This process yielded three primary, interconnected themes: stronger school-home partnerships,

enhanced multi-directional communication, and a deepened sense of community connectedness. These themes collectively showcase relational pedagogy in practice.

Theme 1: Stronger School-Home Partnerships

The first prominent theme was a shared appreciation among all adult participants for the collaborative partnership built to support the students. Teachers expressed gratitude for families actively reinforcing classroom content at home using tactile, game-based resources. Parents, in turn, appreciated that these home-learning materials were engaging rather than burdensome. As one parent noted, the activities felt "fun" and "interactive" and did not feel "like a chore" (Parent B, interview, 2026). Since these activities were easy to implement, parents reported utilizing them frequently, including on the weekends. This consistent, playful reinforcement at home allowed students to solidify literacy concepts "faster" (Teacher A, interview, 2026) enabling educators to build steadily upon a stronger foundation in the classroom. This collaborative approach enriched not only teacher-student dynamics, but also parent-child relationships and the engaging nature of the games even prompted siblings to join in on the activities. Ultimately, by recognizing and valuing each other's roles within this educational team approach, participants supported substantial student growth that outpaced local peers utilizing the same curriculum under traditional, screen-integrated instructional methods.

Theme 2: Enhanced Communication

The second emerging theme centered on improved communication across all stakeholder groups—including school-home, teacher-student, and child-parent interactions by establishing transparency regarding curriculum expectations. Specifically, teachers knew what was required within the classrooms and families knew how to support these goals at home—participation cultivated a highly supportive network. This open communication loop reinforced the foundational idea that raising literate children is a shared relational responsibility, with both families and teachers reporting stronger, more cohesive communicative ties.

Theme 3: Connectedness

The final theme highlighted a profound sense of connectedness and shared community among all participants. This relational closeness was particularly meaningful for one participating multilingual family who had recently immigrated to the United States. They reported that the school's robust school-home partnerships, especially with frequently in person events, transparent communication, and active family participation, allowed them to feel fully immersed in both the school community and their new neighborhood far more rapidly than they had anticipated. The family even noted that they had "only met the principal one time" at their old school, whereas the current school's principal knew them "on a first-name basis" (Parent A, interview, 2026). This deep level of connectedness extended directly to the classroom teachers, who reported knowing their students thoroughly both academically and socially-emotionally. Since the screen-free instruction prioritized dedicated one-on-one time and interactive classroom community building, educators felt highly attuned to their students' "unique personalities" and "different interests" (Teacher B, interview, 2026). This relational bond frequently transcended the classroom walls, with teachers reporting their attendance at weekend extra-curricular activities of their students, such as soccer games and recitals. Ultimately, these findings reveal how prioritizing human-centered, screen-free relationships creates a supportive ecosystem that deeply connects students, families, and educators.

Discussions & Conclusions

The primary objective of this multi-case study was to examine the impact of a screen-free approach to direct literacy instruction, paired with hands-on, game-based home supplements. While the target school, surrounding district, and much of the state utilize a literacy curriculum rooted in the Science of Reading Framework, this study highlights the profound difference that instructional delivery methods can make. Specifically, it contrasts isolating digital screen-based practices with high-touch, relationship-centered human instruction.

The quantitative and qualitative findings of this study offer a compelling alternative to current educational trends. Nationally, the consequences of over-relying on digital interfaces for early learning have become starkly apparent. According to the National Assessment of Educational Progress (NAEP), often referred to as "America's Report Card" notes that the time between 2020 and 2022 saw the largest average score decline in reading since 1990 (NCES, 2025). This historic drop occurred during a period of unprecedented reliance on screen-based instruction and remote learning. While technology will undoubtedly remain integrated into modern society, these national trends suggest that screens cannot replace the foundational human interactions required for early childhood cognitive development.

The rapid literacy progress demonstrated by the two focus students in this study directly supports this assertion. Furthermore, the screen-free focus school's overall proficiency rate on a norm-referenced assessment was 87%, which substantially outperformed the demographically matched, screen-integrated neighboring school at 72% proficiency rate. Crucially, both local institutions outperformed broader benchmarks, including the state average (NJSLA) proficiency rate of approximately 60% and the national norm-referenced median baseline of 50% (NCES, 2025). The tired comparison underscores that while both local schools perform above average, the target school's screen-free, high-touch pedagogical model yields an exceptional, top-tier results that far exceed both state and national norms.

These results demonstrate that when young children are provided with distraction-free, face-to-face direct instruction, they do not merely stay on grade level, but they thrive. Through the lens of relational pedagogy (Noddings, 2013) and Vygotskian social development theory (Vygotsky, 1978), these findings make sense theoretically. Humans are fundamentally social beings and language acquisition, and early literacy are not solitary. By replacing screen-time in the classroom and at home with face-to-face activities and supplemental games the participants in the study cultivated a nurturing community where students and other participants felt safe, valued, and motivated.

Implications and Significance

While extensive research has focused on the cognitive aspects of the Science of Reading approach in early literacy, this study is highly significant because it centers on how early literacy skills are developmentally established. True early literacy acquisition does not happen in isolation on a digital device, but rather it relies on physical books, pencil-and-paper writing, oral communication, and close human connection to build sustaining reading routines, habits, and skills over time.

Additionally, by documenting how two high-needs cases—a multilingual learner and a student with an IEP, who achieved massive literacy gains by the end of the school year, this study serves as a powerful counter-narrative to the post-pandemic push for classroom digitization. It

proved that a return to screen-free and high-touch pedagogy is not a step backwards, but rather a vital path forward for fostering both academic excellence and deep community connectedness.

Limitations

While this study offers valuable insights into the efficacy of screen-free early literacy instruction, several limitations must be acknowledged:

Small Sample Size and Single-Site

The primary limitation is the small sample size (N = 2 students, 2 sets of parents, and 2 teachers) situated within a single school. Therefore, the findings cannot be widely generalized to larger, more diverse student populations. Replicating this study across multiple schools or even different school districts would be necessary to determine if these positive outcomes are universally replicable.

Socioeconomic and Geographic Factors

The geographic and demographic context of the participating school community may limit the transferability of the results. The target school is located within a few miles of a major metropolitan area, where approximately 53% of parents hold a college degree (US Census Bureau, 2024) and median household income is $123,715 as of 2023 (US Census Bureau). These factors suggest a high level of systemic support and resources at home, which may have facilitated the successful and consistent implementation of the at-home game supplements.

District Baseline and Selection Bias

The selected school district is characterized by high historical performance, consistently scoring well on state and local surveys of teacher and parent satisfaction as well as maintaining student proficiency rates above the national average. Since the district already benefits from high baseline academic achievement and strong community engagement, it is difficult to isolate the screen-free intervention as the sole driver of the students' success, and the local and national data posted were not from the current academic year but from the previous school year.

References

Immordino-Yang, M. H. (2016). Emotion, sociality, and the brain's default mode network: Insights for educational practice and policy. *Policy Insights from the Behavioral and Brain Sciences*, *3*(2), 211–219. https://doi.org/10.1177/2372732216656869

Kern, M., & Friedman, H. (2008). *Early educational milestones as predictors of lifelong academic achievement, midlife adjustment, and longevity*. *Journal of Applied Developmental Psychology, 30*(4), 419–430. https://doi.org/10.1016/j.appdev.2008.12.025

Morgan P., Farkas G., Tufis P., & Sperling, R. (2008). Are reading and behavior problems risk factors for each other? *Journal of Learning Disabilities, 41*(5), 417–36. https://doi.org/10.1177/0022219408321123

National Center for Education Statistics. (2025). *2024 NAEP Reading Assessment:* (NCES No. 2024218). U.S. Department of Education, Institute of Education Sciences. https://nces.ed.gov/use-work/resource-library/report/statistical-analysis-report/2024-naep-reading-assessment-results-grades-4-and-8-nation-states-and-districts

Noddings, N. (2013). *Caring: A relational approach to ethics and moral education* (2nd ed.). University of California Press.

NWEA. (2025). *Predicting proficiency on the New Jersey State Learning Assessment (NJSLA) based on NWEA MAP Growth scores*. https://www.nwea.org/uploads/NJ-MAP-Growth-Linking-Study-Report_EOG_2025.pdf

U.S. Census Bureau. (2024). *QuickFacts: Bergen County, New Jersey*. U.S. Department of Commerce. https://www.census.gov/quickfacts/fact/table/bergencountynewjersey/PST045225

U.S. Census Bureau. (2023). *Selected economic characteristics: 2019-2023 American Community Survey 5-year estimates* (Table DP03). U.S. Department of Commerce. https://data.census.gov/

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Harvard University Press.

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Building a Formative Assessment Tool Using the CARE² Model: Strategies for Capturing Learner Perceptions of Instructional Design Frameworks

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Abstract

Measuring instructional design principles is critical for understanding how pedagogical strategies influence learner experiences, engagement, and outcomes (Spooren et al., 2013). The Fujii and Perez (2025) CARE² model, which includes the principles of Culture, Collaboration, Agency, Agility, Relevance, Repetition, Evaluation, and Engagement, is a culturally responsive framework designed to support international learners in higher education. While the model has guided instructional design, it has not yet been formalized as an evaluative instrument to systematically capture learners' perceptions or experiences. To address this gap, each CARE² principle was operationalized as a formative measurement item, with each dimension representing a distinct, non-interchangeable feature of instructional design rather than a reflective latent trait. Correlation analyses revealed theoretically coherent relationships among constructs (r = .355-.705, p < .001), supporting nomological validity. Importantly, the study also provides a practical template for designers and educators to develop their own evaluative instruments, illustrating how theoretically grounded principles can be translated into measurable indicators. By offering a structured, theory-driven lens, this study supports the evaluation and refinement of pedagogical strategies for designing and enhancing meaningful learning environments, while providing evidence-based guidance for instructional improvement.

Keywords: CARE² model, formative assessment, culturally-responsible pedagogy, learner experience, educational evaluation

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Introduction

Course evaluation surveys are commonly used instruments in higher education, playing an important role in instructional evaluation and institutional decision-making (Felder & Brent, 2004; Marsh, 2007; Spooren et al., 2013). Despite their widespread use, the foundations of course measurement are not always examined with the same rigor as other instruments in educational and psychological research (Benton & Cashin, 2012; Uttl et al., 2017). As a result, concerns remain about their validity, including their ability to accurately reflect pedagogical quality and to support fair comparisons across instructors and contexts (Clayson, 2009; Stroebe, 2020). Some argue that these concerns are increased when surveys rely on single-item indicators to capture complex instructional constructs (Bergkvist & Rossiter, 2007; Diamantopoulos et al., 2012). While single-item designs are common in practice due to their efficiency and ease of administration, they raise important methodological questions about reliability and construct representation (Bergkvist & Rossiter, 2007; Diamantopoulos et al., 2012). Traditional psychometric frameworks assume that constructs are best captured through multiple, highly correlated indicators (DeVellis, 2017; Nunnally & Bernstein, 1994). Within this paradigm, single-item measures are often viewed as inherently limited. However, this critique rests on assumptions about the structure of constructs that may not hold in applied educational contexts.

Pedagogical quality is increasingly conceptualized not as a single latent trait, but as a configuration of interrelated instructional design features operating within a learning environment (Doyle, 1986; Lampert, 2001; Wang & Hannafin, 2005). From this perspective, elements such as culture, collaboration, relevance, engagement, and evaluation represent distinct but interacting dimensions rather than interchangeable indicators of one construct, consistent with systems-oriented and design-based approaches to education (Brown, 1992; Cobb et al., 2003; Collins, 1992). For multidimensional constructs, formative measurement models, where indicators define rather than reflect the construct, may be more appropriate (Bollen & Lennox, 1991; Diamantopoulos & Winklhofer, 2001). Misalignment between construct and measurement model can bias estimates and lead to misleading conclusions (Jarvis et al., 2003; MacKenzie et al., 2005), particularly in educational settings where constructs often reflect systems of practice. At the same time, course evaluation research has focused heavily on internal measurement properties while less consistently linking ratings to learning outcomes (Hornstein, 2017; Kane, 2013). Research also suggests that learner evaluations are not always strongly associated with actual learning (Uttl et al., 2017), and comparisons across courses may be confounded by pre-existing learner differences if not properly controlled (Rosenbaum & Rubin, 1983).

This study explores these gaps by developing and validating the CARE² model as a formative, single-item instrument for capturing key dimensions of instructional design. The model includes nine constructs: Culture, Collaboration (peer), Collaboration (instructor), Agility, Agency, Relevance, Repetition, Engagement, and Evaluation, intended to represent core features of the learning environment. Rather than assuming these dimensions reflect a single latent factor, the CARE² model framework conceptualizes pedagogical quality as a composite of distinct but related elements (Fujii & Perez, 2025). To evaluate this approach, the study uses a two-phase validation design that integrates measurement diagnostics with outcome-based survey results. Specifically, it examines whether the CARE² model indicators meet the requirements of formative measurement and whether the resulting composite demonstrates nomological validity by predicting self-reported learning gains (Cronbach & Meehl, 1955).

By linking course evaluation data to external learning outcomes, this study examines the extent to which a course evaluation instrument, using single-items, can be validated or not. The following research questions guide the study:

1. Do the nine CARE² model single-item constructs form a defensible formative composite with acceptable collinearity, outer weights, and sampling adequacy?
2. Does the CARE² model composite demonstrate nomological validity by informing technology learning gains, controlling for pre-existing learner skill levels?

Literature Review

Instructional Measurement in Dynamic Learning Contexts

Educational practice is inherently adaptive, iterative, and context-dependent. Instruction does not function as a fixed intervention but as an evolving system shaped by learners, content, institutional context, and ongoing pedagogical decision-making (Doyle, 1986; Lampert, 2001). This dynamic nature has been widely recognized in design-based research and practitioner inquiry traditions, which emphasize iterative refinement, situated evaluation, and responsiveness to contextual variation as central to educational improvement (Brown, 1992; Cobb et al., 2003; Collins, 1992; Wang & Hannafin, 2005). However, educational measurement has historically been developed under assumptions of stability and generalizability. Most instruments are designed to isolate latent constructs assumed to remain invariant across contexts, enabling psychometric generalization (DeVellis, 2017). This creates a structural mismatch: while instructional systems are adaptive and relational, measurement models are typically static and decomposition-oriented.

Reflective Measurement

Reflective models treat constructs as latent variables that cause observed indicators, which are expected to be interchangeable and highly correlated (Bollen, 1989; DeVellis, 2017). Researchers infer unobservable constructs (e.g., motivation) from observable measures (e.g., survey responses), assuming that changes in the construct are reflected in corresponding changes in indicators (Coltman et al., 2008). Measurement quality is typically assessed via internal consistency (e.g., Cronbach's α), reflecting the assumption of unidimensionality and shared underlying cause (Nunnally & Bernstein, 1994). However, many applied constructs are mis-specified in reflective form when indicators represent distinct conceptual domains rather than interchangeable manifestations (Jarvis et al., 2003). Bollen and Lennox (1991) similarly argue that many constructs are better understood as composites, where indicators define rather than reflect the construct. Reliance on α is further limited by its sensitivity to scale length and tau-equivalence assumptions, and can encourage item redundancy that narrows construct coverage (Cronbach, 1951; Sijtsma, 2009; Streiner, 2003). Consequently, conventional reflective criteria may be poorly suited to multidimensional or system-based constructs.

Formative Measurement

Formative measurement offers a theoretically grounded alternative in which indicators define rather than reflect the construct, with each capturing a distinct component of the phenomenon (Bollen & Lennox, 1991; Diamantopoulos & Winklhofer, 2001). This approach is well suited to composite, multidimensional, and system-oriented constructs, where specification should follow conceptual definition rather than statistical convenience (MacKenzie et al., 2005). When constructs are defined by their components, formative specification is often necessary, and

misalignment between construct and model can lead to invalid inferences even when statistical criteria appear acceptable. Formative measurement also shifts the focus of validity from internal consistency to content validity, ensuring adequate coverage of the construct domain, alongside nomological validity (theoretical relationships) and criterion validity (prediction of outcomes) (Cronbach & Meehl, 1955; Diamantopoulos & Winklhofer, 2001). Together, these criteria provide a more appropriate framework for evaluating measurement quality in complex systems.

Single-Item Measurement

The debate over single-item measurement further illustrates the tension between psychometric rigor and practical utility. Within reflective paradigms, single-item measures are often viewed as inherently inferior due to concerns about reliability and measurement error (Nunnally & Bernstein, 1994). However, this critique assumes that constructs require multiple interchangeable indicators, an assumption that does not hold in formative or diagnostic contexts. Bergkvist and Rossiter (2007) provide empirical evidence that single-item measures can perform comparably to multi-item scales when constructs are concrete and unambiguous. Similarly, Diamantopoulos et al. (2012) argue that the appropriateness of single-item measures depends on the nature of the construct and the purpose of measurement. For evaluative and diagnostic applications, where the goal is to capture overall perceptions or judgments, a single well-designed item may be sufficient.

Methodology

Research Design

This study used a quasi-experimental pre-post design, which is a common approach in educational research when random assignment is not possible (Shadish et al., 2002). A CARE² model course quality survey was administered at the end of the course. In addition, pre-post course technology proficiency surveys were administered at the beginning and end of each course, consistent with standard pretest-posttest approaches for measuring learning gains (Dimitrov & Rumrill, 2003).

Participants

A total of 96 learners completed the CARE² model end-of-course survey, and 91 learners completed both the pre-post course knowledge assessment. Learners were primarily aged 18-24, representing diverse national backgrounds including Nepal and Bangladesh, reflecting the heterogeneity typical of contemporary higher education populations (Canton, 2021).

Instruments

The study used two instruments: the CARE² model survey and a pre- and post-test proficiency survey. The CARE² model survey comprises nine constructs, each measured by a single item on a five-point Likert-type scale (1 = Strongly Disagree, 5 = Strongly Agree). The use of Likert-type scales is standard in educational and psychological measurement for capturing perceptions and attitudes (Edmondson, 2005). The nine constructs include: (1) Culture, (2) Peer Collaboration, (3) Instructor Collaboration, (4) Autonomy, (5) Agility, (6) Relevance, (7) Repetition, (8) Engagement, and (9) Evaluation (see Appendix for instrument details). Each construct is operationalized as a distinct dimension of instructional design, consistent with

formative measurement approaches in which indicators define the construct domain (Bollen & Lennox, 1991; Diamantopoulos & Winklhofer, 2001). The use of single-item indicators aligns with prior research suggesting that single-item measures can be appropriate for concrete, unambiguous constructs, particularly in applied and evaluative contexts (Bergkvist & Rossiter, 2007; Diamantopoulos et al., 2012). In addition, a technology proficiency survey included 11 items assessing digital skills and self-efficacy relevant to the course context. The items used five-point Likert-type response formats. A technology composite score was computed as the mean of all items.

Analytical Strategy

The study examined data across two phases. The first phase examined the CARE² model survey using formative measurement. Several analyses were used to evaluate formative indicators: descriptive statistics, correlation matrices, and multicollinearity diagnostics including variance inflation factor (VIF), tolerance, and condition index (Hair et al., 2018). Outer weights and loadings were examined to assess indicator contributions, with bootstrapping (B = 5,000) used to evaluate statistical significance, consistent with recommended practices in formative measurement and partial least squares modeling (Hair et al., 2018). Harman's single-factor test was also conducted to assess potential common method bias, a standard diagnostic in survey-based research (Podsakoff et al., 2003). Independent samples t-tests were used to compare CARE² model construct scores across the two groups, consistent with standard procedures for group mean comparison (Ary et al., 2018). The second phase examined the nomological validity, which included pretest equivalence testing, within-group pre-post comparisons, and between-group comparisons of post-test scores.

Results

Descriptive Statistics

Descriptive statistics for the CARE² dimensions showed mean scores ranging from 3.72 (SD = 0.97) for Evaluation to 4.08 (SD = 0.74) for Instructor Collaboration, reflecting generally favorable learner perceptions (Table 1). All items spanned the full response range and demonstrated acceptable distributional properties. Skewness (-1.18 to -0.64) and excess kurtosis (0.21 to 2.92) were within recommended thresholds for Likert-type measures, supporting the use of parametric analyses (Field, 2018; Hair et al., 2018). See Table 1.

Table 1
Descriptive Statistics for CARE² Model Single-Item Constructs (N = 96)

Construct	M	SD	Min	Max	Skewness	Kurtosis
Culture	3.80	0.86	1	5	-0.77	1.02
Collaboration_Peer	3.89	0.81	1	5	-1.18	2.76
Collaboration_Instructor	4.08	0.74	1	5	-0.82	1.66
Autonomy	3.95	0.75	1	5	-0.65	1.10
Agility	3.89	0.75	1	5	-1.03	2.92
Relevance	4.06	0.76	1	5	-0.91	1.69

Repetition	3.84	0.87	1	5	-0.64	0.21
Engagement	3.94	0.69	1	5	-0.75	1.96
Evaluation	3.72	0.97	1	5	-0.76	0.32

Pearson Correlation Matrix

Pearson correlations among the nine CARE² model indicators reveal correlations ranging from r = .355 (Culture with Peer Collaboration and Agility) to r = .719 (Instructor Collaboration with Autonomy), with all associations statistically significant ($p < .001$) (see Table 2). Moderate correlations were observed among Instructor Collaboration, Autonomy, Agility, Relevance, and Evaluation (r = .602-.719), suggesting related yet distinct instructor and process-oriented dimensions. Culture showed the weakest associations with other indicators (r = .35-.42). Importantly, no correlation approached the .90 threshold indicative of multicollinearity or redundancy (Hair et al., 2018), supporting the formative assumption that the CARE² model indicators are related but nonredundant. See Table 2.

Table 2
Pearson Correlation Matrix Among CARE² Model Formative Indicators

Construct	C	CP	CI	Au	Ag	Re	Rp	En	Ev
Culture	1.000	0.355	0.413	0.413	0.356	0.395	0.371	0.424	0.406
Collab_Peer		1.000	0.557	0.530	0.478	0.473	0.367	0.470	0.444
Collab_Instr			1.000	0.719	0.625	0.602	0.516	0.528	0.531
Autonomy				1.000	0.642	0.661	0.531	0.589	0.628
Agility					1.000	0.647	0.557	0.608	0.705
Relevance						1.000	0.602	0.620	0.648
Repetition							1.000	0.542	0.576
Engagement								1.000	0.640
Evaluation									1.000

Note. C = Culture; CP = Collab_Peer; CI = Collab_Instructor; Au = Autonomy; Ag = Agility; Re = Relevance; Rp = Repetition; En = Engagement; Ev = Evaluation. Upper triangle only; lower triangle intentionally blank.

Variance Inflation Factor and Tolerance

The findings of the VIF and Tolerance analyses show that all nine VIF values fell below the formative model threshold of 3.3 (Hair et al., 2018), ranging from 1.350 (Culture) to 2.800 (Autonomy). In addition, the tolerance values all exceeded .35 (see Table 3). These results indicate that multicollinearity is not a concern, meaning that each retains sufficient unique variance to contribute a distinct, interpretable signal to the composite. Although Autonomy, Agility, Evaluation, and Instructor Collaboration show relatively higher VIF values (2.51-2.80), this pattern is consistent with the moderate intercorrelations observed among these constructs and remains well within acceptable limits for formative specification. See Table 3.

Table 3
Variance Inflation Factor (VIF) and Tolerance

Construct	VIF	Tolerance
Culture	1.350	0.741
Collaboration_Peer	1.611	0.621
Collaboration_Instructor	2.542	0.393
Autonomy	2.800	0.357
Agility	2.638	0.379
Relevance	2.514	0.398
Repetition	1.854	0.539
Engagement	2.159	0.463
Evaluation	2.623	0.381

Note. VIF threshold for formative models: < 3.3 (2022). Tolerance = 1/VIF.

Condition Index

The eigenvalue-based condition indices independently confirmed the absence of problematic collinearity (see Table 4). The maximum condition index was 4.705 (Dimension 9), which is well below the 15.0 lower warning threshold (Kim, 2019). The first eigenvalue (5.316) captured the dominant shared variance among indicators, consistent with the theoretical expectation of a coherent composite, while the remaining eigenvalues distributed variance across eight additional dimensions, confirming each indicator's unique contribution. See Table 4.

Table 4
Eigenvalues and Condition Indices

Dimension	Eigenvalue	Condition Index
1	5.316	1.000
2	0.747	2.669
3	0.699	2.757
4	0.500	3.260
5	0.467	3.374
6	0.386	3.713
7	0.345	3.924
8	0.300	4.212
9	0.240	4.705

Note. CI = $\sqrt{(\lambda_max / \lambda_k)}$. Thresholds: < 15 = no collinearity; 15–30 = moderate; > 30 = severe.

Outer Weights and Bootstrapped Significance

All outer weights were statistically significant (ps < .001), with t-statistics ranging from 8.248 (Culture) to 22.527 (Autonomy), and none of the 95% confidence intervals included zero. Outer loadings ranged from 0.601 (Culture) to 0.830 (Autonomy), exceeding the recommended minimum of .50 (Hair et al., 2018), with seven surpassing .70. Only Culture (λ = 0.601) and Peer Collaboration (λ = 0.679) fell in the moderate range. Overall, the results support retaining all nine indicators in the formative composite. See Table 5.

Table 5
Outer Weights, Outer Loadings, and Bootstrapped Significance (B = 5,000)

Construct	Outer Weight	Outer Loading	Bootstrap SE	t	p	95% CI
Culture	0.4593	0.6008	0.095	8.248	< .001	[0.597, 0.974]
Collaboration_Peer	0.5194	0.6794	0.079	11.261	< .001	[0.730, 1.044]
Collaboration_Instructor	0.6101	0.7981	0.063	16.588	< .001	[0.913, 1.163]
Autonomy	0.6348	0.8303	0.048	22.527	< .001	[0.988, 1.178]
Agility	0.6243	0.8166	0.081	13.141	< .001	[0.907, 1.228]
Relevance	0.6276	0.8210	0.057	18.789	< .001	[0.955, 1.181]
Repetition	0.5625	0.7358	0.067	14.311	< .001	[0.829, 1.095]
Engagement	0.6023	0.7878	0.067	15.461	< .001	[0.893, 1.156]
Evaluation	0.6198	0.8107	0.071	14.951	< .001	[0.936, 1.210]

Note. Outer loading = Pearson r(indicator, unit-weighted composite). All p-values < .001 (two-tailed). CI = 95% percentile bootstrap interval.

Common Method Bias: Harman's Single Factor Test

When applying Harman's single-factor test results, the first unrotated factor accounted for 59.07% of total variance across the nine CARE² model items, exceeding the 50% benchmark (Podsakoff et al., 2003). While this may suggest a general factor, these results are expected given that the items reflect related dimensions of a higher-order construct (perceived pedagogical quality) and share a common survey format. Moreover, Harman's test is widely regarded as a limited diagnostic and not definitive evidence of common method bias (Podsakoff et al., 2003). See Table 6.

Table 6
Harman's Single Factor Test: Unrotated Principal Component Solution

Factor	Eigenvalue	% Variance	Cumulative %
F1	5.316	59.07	59.07
F2	0.747	8.30	67.37
F3	0.699	7.77	75.14
F4	0.500	5.56	80.69
F5	0.467	5.19	85.88
F6	0.386	4.28	90.17
F7	0.345	3.84	94.00
F8	0.300	3.33	97.33
F9	0.240	2.67	100.00

Note. CMB threshold: first factor > 50% (Podsakoff et al., 2003).

CARE² Model Construct-Technology Nomological Alignment

Nomological alignment results between the CARE² model constructs and technology survey items show that six of the nine CARE² model constructs map directly onto technology outcomes: Autonomy (digital self-sufficiency), Agility (ease of learning new technology), Relevance (technology awareness and internet research confidence), Repetition (PowerPoint skill acquisition through practice), Engagement (LMS navigation), and Evaluation (online assessment submission). Culture, Peer Collaboration, and Instructor Collaboration are interpersonal dimensions without direct technological counterparts and are therefore represented indirectly within the composite. See Table 7.

Table 7
Nomological Alignment of CARE² Model Constructs With Technology Outcome Items

CARE² Construct	Technology Outcome Item(s)	Theoretical Rationale	Alignment
Culture	N/A	Learning culture is contextual; no direct technology item captures it	Indirect
Collaboration_ Peer	N/A	Peer collaboration not directly measured in technology survey	Indirect
Collaboration_ Instructor	N/A	Instructor collaboration not captured in technology items	Indirect
Autonomy	Sufficient digital skills	Self-sufficiency in digital tools reflects autonomous capability	Direct
Agility	Learn new technologies	Ease of learning new tech directly operationalizes agility	Direct

Relevance	Follow new tech; Internet search confidence	Connecting content to current technology reflects relevance	Direct
Repetition	PPT experience (×4 sub-skills)	Repeated skill practice drives measurable tech proficiency gains	Direct
Engagement	Navigate Moodle; Submit online	Active LMS use and online submission indicate engaged participation	Direct
Evaluation	Submit assessment online	Successful submission is the proximal indicator of assessment completion	Direct

Note. Direct = specific technology item corresponds to the CARE² model construct. Indirect = no direct item; represented through composite.

Pre-Post Technology Change

When examining the pre-post results, paired t-tests for 91 matched learners show that eight of eleven items revealed significant improvement, with the largest gains in online assessment submission ($\Delta = +1.40$, $d = 1.250$), PowerPoint narration ($\Delta = +0.90$, $d = 0.956$), insertion ($\Delta = +1.10$, $d = 0.938$), and saving ($\Delta = +1.19$, $d = 0.969$), indicating strong skill acquisition in course-specific tasks. The overall technology composite increased by 0.631 SDs ($t(90) = -9.274$, $p < .001$, $d = 1.225$), reflecting a large improvement in proficiency. Non-significant gains in broader skills (e.g., learning new technologies, following new technologies, internet search confidence) suggest these were less directly targeted by the curriculum. See Table 8.

Table 8
Pre-Post Paired t-Tests (n = 91 Matched Pairs)

Technology Item	Pre M (SD)	Post M (SD)	Gain	t	p	Cohen's d
Sufficient digital skills	3.10 (0.97)	3.57 (0.82)	+0.47	-3.893	< .001	0.509
Learn new technologies	3.45 (1.12)	3.62 (1.02)	+0.16	-1.224	.224	0.142
Navigate Moodle (LMS)	3.70 (0.92)	4.21 (0.77)	+0.50	-4.700	< .001	0.534
Submit assessment online	2.55 (0.93)	3.96 (0.77)	+1.40	-11.925	< .001	1.250
Follow new technologies	3.33 (0.97)	3.56 (0.90)	+0.23	-1.890	.062	0.241
Confident internet search	3.40 (0.95)	3.62 (0.96)	+0.22	-1.789	.077	0.209
Library database access	2.64 (1.20)	3.40 (1.03)	+0.74	-5.222	< .001	0.606
PPT: Make presentation	1.69 (0.80)	2.72 (1.10)	+1.04	-6.920	< .001	0.900

PPT: Insert images	1.73 (1.01)	2.82 (1.18)	+1.10	-6.049	< .001	0.938
PPT: Narrate presentation	1.33 (0.68)	2.24 (0.93)	+0.90	-6.827	< .001	0.956
PPT: Save as .pptx	1.83 (1.00)	3.02 (0.99)	+1.19	-7.443	< .001	0.969
Technology Composite	-0.22 (0.52)	0.41 (0.59)	+0.63	-9.274	< .001	1.225

Note. n = 91 matched pairs via learner ID. Paired t-test. Gain = Post M - Pre M. Cohen's d = mean difference / SD of difference scores. ns = p ≥ .05. *** p < .001.

Discussion

This study set out to validate the CARE² model course quality instrument through two complementary lenses: formative measurement diagnostics and nomological validity testing against technology learning gains. The results converge to support three principal conclusions: 1/ the CARE² model formative composite is measurement-model defensible, 2/ it is criterion-valid in that the group with higher CARE² model ratings demonstrated substantially greater technology skill gains. More details about the study results are as follows:

Research Question 1: Formative Measurement Validity

The first phase results establish that the CARE² model indicator set meets all quantitative thresholds for a well-specified formative measurement model. The absence of problematic multicollinearity (all VIFs < 3.3; maximum condition index = 4.71) means that outer weight estimates are stable and interpretable, with each indicator's unique contribution to the composite can be reliably estimated and is not distorted by overlap with co-indicators. The universal statistical significance of outer weights (all ps < .001, bootstrapped B = 5,000) confirms that none of the nine indicators is redundant or expendable. Even the weakest contributors, Culture (outer loading = 0.601) and Peer Collaboration (outer loading = 0.679), still exceed the minimum loading threshold and contribute unique variance absent from the other seven indicators.

In addition, we argue that the relatively low loading of Culture is theoretically meaningful rather than psychometrically problematic. Culture reflects institutional and environmental conditions that transcend any single class or instructor; its weaker correlation with the composite defined by the other eight instructor-modifiable dimensions is what we would expect if it captures a distinct, more institutionally situated facet of the learning environment. We see this distinctiveness as an argument for its retention, since without it, the composite would capture only those dimensions of course quality that are directly under instructor control, omitting the broader cultural context in which instruction occurs.

Research Question 2: Nomological Validity and the Meaning of the Composite

The second-phase results provide the most substantively important finding: the group whose learners perceived higher course quality on the CARE² model composite also demonstrated measurably higher technology learning outcomes. The learners, who entered the class with statistically equivalent technology skills (composite d = -0.07), exited with significantly higher proficiency (composite d = 0.38) and showed larger gains on 8 of 11 technology items. This pattern constitutes group-level nomological validity evidence, suggesting that the CARE²

model composite score is not merely a self-contained self-report measure but corresponds to observable differences in learning.

Implications

The results present several implications that should be addressed, especially given the nature of this study and its two-phased analytical approach. The implications are as follows:

Common Method Bias

The results of Harman's single-factor result (59.07%) warrant cautious interpretation. Although the CARE² model items were collected via a single self-report instrument at a single time point, conditions associated with common method bias (e.g., shared method, uniform response format, and positively worded items) are present, and their potential influence cannot be fully excluded. However, the magnitude of the first factor is also consistent with a coherent construct domain, where substantial shared variance is expected among related dimensions of pedagogical quality. Importantly, the learning outcome results provide partial evidence against a purely method-driven explanation, as CARE² model ratings are aligned with differences in technology learning gains across instructional contexts. This pattern is more consistent with substantive variance in perceived pedagogical quality than with common method bias alone.

Measurement Practice

This study demonstrates that a nine-item, single-item-per-construct survey can satisfy formative measurement requirements when rigorously evaluated. Researchers deploying similar instruments should conduct a full diagnostic report, particularly VIF analysis and bootstrapped outer weight significance, rather than assuming that a clean correlation matrix implies measurement validity. The formative framework is the appropriate default when constructs are theoretically non-interchangeable and single items are used, and its diagnostics are less demanding than those of reflective models precisely because they do not require within-construct reliability.

Limitations

Several limitations constrain the interpretation of these findings. For one, the common method bias, flagged by Harman's single-factor test (first factor = 59.07%), is a plausible concern for the CARE² model's self-report data. Although pre-test equivalence testing showed comparable technology skill levels at class entry, unmeasured confounders, like learner motivation, course load, prior academic performance, or demographic characteristics, may account for some of the observed differences. The study design does not support a causal attribution of the differences in gains to pedagogical quality specifically. The study's generalizability is limited to the institutional and instructional contexts studied. The learner population (primarily aged 18–24, representing South Asian backgrounds) and the specific technology-focused course context may not generalize to other disciplines, institutions, or demographic groups. Finally, the CARE² model single-item design, while meeting formative measurement standards, does not allow for estimation of measurement error at the construct level, meaning that random measurement error is unquantified and potentially consequential for the precision of composite estimates.

Future Research

Future research should examine multi-item indicators for some CARE² model constructs, particularly Culture and Autonomy, where single-item measures may not fully capture conceptual breadth. While single-item formative measurement is defensible, short multi-item versions would enable more nuanced assessment and convergent validation against established instructional design measures. Further work should also test the relationship between CARE² model dimensions and objective outcomes such as academic performance, course completion, and skill transfer, as the present study focused on evaluative judgments rather than downstream behavioral effects. In addition, procedural refinements are recommended to further reduce potential common method bias, including item randomization, incorporation of reverse-coded items, and temporal separation of measures. Adding two to three items per construct would also enable within-construct reliability estimation and support extension toward a reflective and formative hierarchical model.

Conclusion

This study examined whether the CARE² model, constructed from single-item indicators, can be defended as a valid measure of course quality. The findings support this claim on both measurement and substantive grounds. Formative diagnostics indicate that all nine indicators contribute unique, non-redundant variance to the composite, with acceptable multicollinearity, significant outer weights, and adequate sampling properties. Substantively, learners with comparable baseline technology skills exhibited meaningfully different learning gains depending on their CARE² model ratings, providing nomological evidence that the composite reflects real differences in learning outcomes rather than self-report artifacts. Together, these results support the CARE² model as a defensible formative measure of pedagogical quality that corresponds to meaningful differences in learner learning.

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

The author declares that Grammarly, an AI-assisted writing software, was used to proofread and refine the language of the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from Grammarly, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are original and derived from the appropriate and systematic conduct of the research.

References

Ary, D., Jacobs, L. C., Sorensen Irvine, C., & Walker, D. A. (2018). *Introduction to research in education* (10th ed.). Cengage Learning.

Benton, S. L., & Cashin, W. E. (2012). *Student ratings of teaching: a summary of research and literature*. IDEA Paper No. 50.

Bergkvist, L., & Rossiter, J. R. (2007). The predictive validity of multiple-item versus single-item measures of the same constructs. *Journal of Marketing Research, 44*(2), 175–184. https://doi.org/10.1509/jmkr.44.2.175

Bollen, K. A. (1989). *Structural equations with latent variables*. Wiley.

Bollen, K. A., & Lennox, R. (1991). Conventional wisdom on measurement: a structural equation perspective. *Psychological Bulletin, 110*(2), 305–314. https://doi.org/10.1037/0033-2909.110.2.305

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of the Learning Sciences, 2*(2), 141–178. https://doi.org/10.1207/s15327809jls0202_2

Canton, H. (2021). Organization for economic co-operation and development—OECD. In *The Europa Directory of International Organizations 2021* (pp. 677–687). Routledge.

Clayson, D. E. (2009). Student evaluations of teaching: are they related to what students learn? *Journal of Marketing Education, 31*(1), 16–30. https://doi.org/10.1177/027347530832408

Cobb, P., Confrey, J., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher, 32*(1), 9–13. https://doi.org/10.3102/0013189X032001009

Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New Directions in Educational Technology* (pp. 15–22). Springer.

Coltman, T., Devinney, T. M., Midgley, D. F., & Venaik, S. (2008). Formative versus reflective measurement models: two applications of formative measurement. *Journal of Business Research, 61*(12), 1250–1262. https://doi.org/10.1016/j.jbusres.2008.01.013

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297–334. https://doi.org/10.1007/BF02310555

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin, 52*(4), 281–302. https://doi.org/10.1037/h0040957

DeVellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). Sage.

Diamantopoulos, A., Riefler, P., & Roth, K. P. (2008). Advancing formative measurement models. *Journal of Business Research, 61*(12), 1203–1218. https://doi.org/10.1016/j.jbusres.2008.01.009

Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P., & Kaiser, S. (2012). Guidelines for choosing between multi-item and single-item scales for construct measurement: a predictive validity perspective. *Journal of the Academy of Marketing Science, 40*(3), 434–449. https://doi.org/10.1007/s11747-011-0300-3

Diamantopoulos, A., & Winklhofer, H. M. (2001). Index construction with formative indicators: an alternative to scale development. *Journal of Marketing Research, 38*(2), 269–277. https://doi.org/10.1509/jmkr.38.2.269.18845

Dimitrov, D. M., & Rumrill, P. D. Jr. (2003). Pretest-posttest designs and measurement of change. *Work, 20*(2), 159–165. https://doi.org/10.3233/WOR-2003-00285

Doyle, W. (1986). Classroom organization and management. In M. C. Wittrock (Ed.), *Handbook of Research on Teaching* (3rd ed., pp. 392–431). Macmillan.

Edmondson, D. (2005, May). Likert scales: A history. In *Proceedings of the Conference on Historical Analysis and Research in Marketing* (vol. 12, pp. 127–133).

Field, A. P. (2018). *Discovering statistics using IBM SPSS statistics*. (5th ed). Sage, Newbury Park.

Felder, R. M., & Brent, R. (2004). How to evaluate teaching. *Chemical Engineering Education, 38*(3), 200–202.

Fujii, K., & Perez, N. (2025). The CARE² model: action research study exploring multicultural experiences in higher education. *International Journal for Educational Media and Technology, 19*(2). https://www.ijemt.org/index.php/journal/article/view/382

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2018). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24.

Hornstein, H. A. (2017). Student evaluations of teaching are an inadequate assessment tool for evaluating faculty performance. *Cogent Education, 4*(1), 1304016. https://doi.org/10.1080/2331186X.2017.1304016

Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification. *Journal of Consumer Research, 30*(2), 199–218. https://doi.org/10.1086/376806

Kane, M. T. (2013). Validating the interpretations and uses of test scores. *Journal of Educational Measurement, 50*(1), 1–73. https://doi.org/10.1111/jedm.12000

Kim, J. H. (2019). Multicollinearity and misleading statistical results. *Korean Journal of Anesthesiology*, *72*(6), 558–569. https://doi.org/10.1016/j.indmarman.2023.03.010

Lampert, M. (2001). *Teaching problems and the problems of teaching*. Yale University Press.

MacKenzie, S. B., Podsakoff, P. M., & Jarvis, C. B. (2005). The problem of measurement model misspecification in behavioral and organizational research. *Journal of Applied Psychology, 90*(4), 710–730. https://doi.org/10.1037/0021-9010.90.4.710

Marsh, H. W. (2007). Students' evaluations of university teaching: dimensionality, reliability, validity, potential biases and usefulness. In *The Scholarship of Teaching and Learning in Higher Education: an evidence-based perspective* (pp. 319–383). Springer Netherlands.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika, 70*(1), 41–55. https://doi.org/10.1093/biomet/70.1.41

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). Quasi-experiments: interrupted time-series designs. In *Experimental and Quasi-Experimental Designs for Generalized Causal Inference* (pp. 171–205). Houghton Mifflin.

Sijtsma, K. (2009). On the use, the misuse, and the very limited usefulness of Cronbach's alpha. *Psychometrika, 74*(1), 107–120. https://doi.org/10.1007/s11336-008-9101-0

Spooren, P., Brockx, B., & Mortelmans, D. (2013). On the validity of student evaluation of teaching: the state of the art. *Review of Educational Research, 83*(4), 598–642. https://doi.org/10.3102/0034654313496870

Streiner, D. L. (2003). Starting at the beginning: an introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment, 80*(1), 99–103. https://doi.org/10.1207/S15327752JPA8001_18

Stroebe, W. (2020). Student evaluations of teaching encourages poor teaching and contributes to grade inflation: a theoretical and empirical analysis. *Basic and Applied Social Psychology, 42*(4), 276–294. https://doi.org/10.1080/01973533.2020.1756817

Uttl, B., White, C. A., & Gonzalez, D. W. (2017). Meta-analysis of faculty's teaching effectiveness: student evaluation of teaching ratings and student learning are not related. *Studies in Educational Evaluation, 54*, 22–42. https://doi.org/10.1016/j.stueduc.2016.08.007

Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development, 53*(4), 5–23. https://doi.org/10.1007/BF02504682

Appendix

Instruments: CARE² Model Perception Survey Items

Learners completed a nine-item perception survey designed to evaluate their experiences within the pedagogical model. All items were transformed to align with micro-units as compared with class or course. The items were measured using a 5-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

1. My background and experiences were valued during the micro-units.
2. Working with peers enhanced my learning in the micro-units.
3. Interactions with the micro-units instructor supported my learning.
4. The micro-units provided clear expectations that encouraged me to take responsibility for learning.
5. The instructor adapted the micro-unit content to meet learners' needs.
6. The micro-unit content was meaningful and connected to final course assessments.
7. Important topics, models, or theories for Assessment 1 were reviewed multiple times to reinforce learning.
8. Interactive activities kept me actively involved in learning.
9. I received timely feedback, based on questions and answers, during the micro-unit sessions that helped me improve my knowledge or skills.

Instruments: Technology Survey Items (Pre and Post)

Learners completed a multiple-item survey measured using 5-point agreement scale ranging from Strongly Disagree to Strongly Agree, with item 7 measured using a 5-point confidence scale ranging from Extremely Unconfident to Extremely Confident. Collectively, these items served as indicators of learners' perceived digital confidence across general technology use, learning management system navigation, online assessment submission, technology awareness, information literacy, and academic research skills.

1. I have sufficient skills in digital technology.
2. I can learn new digital technologies without difficulty.
3. I know how to find and navigate the Moodle room.
4. I know how to turn in my assessment online (by uploading it to LearningZone).
5. I follow important new technologies (like ChatGPT).
6. I feel confident in my searches for information online (research, homework, etc.).
7. How confident are you in accessing and using library databases on your laptop?

Renaissances as a Practice-Based Research in Teaching: Where Arts' Histories Begin

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Abstract

"In the Antiroom: Arts' Histories as a Pluriversal Proposal" is an ongoing doctoral research characterized by its interdisciplinary and indisciplinary nature, engaging the fields of art education, media and technology, history, and the arts. It draws on the researcher's teaching and research practices, as previously explored in "Arts' Histories: Simultaneity as a Methodological Approach" (Leme & Sarzi-Ribeiro, 2025). Briefly cited in that study, the teaching experience titled Renaissances — which this paper explores in depth — was conceived as an antiroom practice (derived from the Portuguese antisala), where other artistic and cultural flourishings were "temporally and/or epistemologically related and layered to the movement that had its epicenter in Florence" (Leme & Sarzi-Ribeiro, 2025). In this context, the Harlem, Catalan, Italian, and Mexican Renaissances were placed in dialogue with the bodies of work of Harmonia Rosales (Pinto, 2019) and Beyoncé, along with artistic and cultural productions associated with Kemet, Chimú, Marajoara, Ifé, and many other civilizations, peoples, cultures, and temporalities. Given that the Italian Renaissance, especially through the figure of Giorgio Vasari, marks what can be regarded as the beginning of art history, this pedagogical practice, taught during the researcher's initial experience in Brazilian higher education and currently being expanded, serves as a weft for pluriversal educational proposals. By playing with its title, it encourages reflections on decoloniality, convergences, and critically intercultural interpretations within the histories, nomenclatures, and concepts of art, making space for other ways of teaching and learning, beyond a single and, therefore, local [art] history (Adichie, 2009; Mignolo, 2020).

Keywords: art history, arts' histories, teaching experience report, practice-based research

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Introduction

Classroom experiences can generate other forms of knowledges in creative, authentic, and expansive ways, especially when hierarchies between teachers and students are dissolved, allowing time and space for collaboration and collectivity, fostering combinations of different elements and information—which, in the Arts' Histories and, certainly, in the antirooms practices, can lead us to other chronotopes. This was the case with Renaissances, a class taught for the first time in 2022, to the first-year cohort of the Visual Arts undergraduate program at the FAAC-UNESP (Brazil), while taking the course "Art History: From the Renaissance to Pre-Impressionism." As with most curricula, this course focused predominantly on European ethnocentrism, particularly on the historical period during which the continent began to consolidate its domination over other peoples, cultures and territories. Over the course of this process, such domination would be legitimized through narratives and images of the alleged uniqueness and superiority of its culture, economy, and society, partly crystallized in what became known as Renaissance.

Since the classroom itself has been conceived, from a methodological standpoint, as a site of experimentation and exploration in order to conceive other directions for Arts and its histories, the very use of the plural "Renaissances" served to challenge the knowledge acquired by the students and even by the teacher herself up to that point, leading, not only during that semester but throughout these next four years, to very interesting insights and ramifications, such as the current doctoral research "In the Antiroom: Arts' Histories as a Pluriversal Proposal" and the final projects "The contribution of Afro-Brazilian art to the construction of the identity of children and adolescents" (Santana, 2025) and "Gender and Sexuality in Art Education: a view through Visual Culture Education and the Queer perspective" (Fialho, 2025). Even though the latter two researchers, students who took the undergraduate course mentioned earlier, are fully credited for their own work, both have amplified the discussions that form part of the Arts' Histories, and, therefore, its respective Renaissances, into their own investigations.

Prior to discussing the beginnings of Arts' Histories—that is, its Renaissances—the article first outlines the methodological approaches and tools applied. This paper takes the form as an experience teaching report, grounded in the understanding of the teaching practice importance and centrality, especially through decolonial and pluriversal Art History classrooms (antirooms) as sites of practice-based research (Candy, 2006), where learning environments turn into collaborative research ecosystems, highlighting the possibilities that arise when theoretical disciplines are developed within creative academic programs such as Visuals Arts. To fully understand the antiroom experience called Renaissances, when and where Arts' Histories have emerged, to paraphrase Giorgio Vasari's "Le vite de' più eccellenti pittori, scultori e architettori" (1550), regarded here as one possible beginning of Art History as a modern concept, emerging alongside the constitution of the modern/colonial world-system (Grosfoguel, 2006, 2013; Mignolo, 2020; Wallerstein, 1992) and the colonial narratives that sustained it, it is useful to briefly conceptualize these terms, leading to the pluriversal proposal itself: in the following paragraphs, "Arts' Histories" and "antiroom" will be introduced jointly. Thus, both concepts are discussed in greater depth in the previous article, cited in the abstract.

Arts' Histories are a methodological pluriversal proposal that has been developed in the classroom since the beginning of the researcher's teaching career, in 2022, challenging the linear and singular narrative of art history by emphasizing the simultaneity of artistic, cultural, and community events across the globe and their multiple temporalities and territories, grounded in the concepts and practical applications of decoloniality and pluriversality

(Grosfoguel, 2006, 2013, Kothari et al., 2022; Mignolo, 2008, 2017, 2020), and critical interculturality (Walsh et al., 2018; Walsh, 2005, 2010, 2019). In this way, a pluriversal and decolonial possible approach to education, research, and the history of art entails recognizing not only the objects of investigation, teaching, and artistic production, as if they were isolated from other domains, but also the community contexts and relations in which these systems of knowledge exchange are embedded.

In this sense, the research first unfolded through classroom practice, where simultaneous and critical time and space displays led to the formulation of the "antiroom" concept (derived from the Portuguese antisala), now constituting a foundational concept in the doctoral investigation of which this paper forms a part. An antiroom practice occurs as an artistic and epistemological activation, when the entire group (the classroom) engages in discussions and productions that interrogate and desestabilize established concepts of art history. In other words, antiroom practices are totally correlated to Arts' Histories, where these pedagogical encounters generate multiple time-space wefts, instead of only one chronological line.

Within the framework of Arts' Histories and its numerous antirooms, significant emphasis is placed on context and place from which knowledge is produced and reworked. By engaging and reconfiguring multiple temporalities, dancing with them, this perspective challenges the supposedly neutral conception of space-time, characteristic of European thought, in which the site of knowledge production is dissociated from the knowledge itself or considered irrelevant. Such a conception overlooks the fact that epistemologies – all of them – only emerge on a specific local history (Mignolo, 2020), that is, on a specific time and place – epistemologies neither are neutral nor universal. Certainly, any claim to universality remains situated on a particular fraction of a particular reality. Art History, as both an idea and a realm, can be understood through this critique. From this perspective, two main concepts arise: local history/global designs (Mignolo, 2020) and single story (Adichie, 2009), which open the discussions of the following section.

Main Reading

To assert that Art History is a local history—and, therefore, a single story—implies a dialogue between the references that give meaning to these terms. According to Adichie (2009, p. 5) "The single story creates stereotypes, and the problem with stereotypes is not that they are untrue, but that they are incomplete. They make one story become the only story", raising questions about the use of the word "story" rather than the term "history," which, in this study, aligns with the notion and concepts Mignolo (2020, p. 96–97) uses to describe colonialism/modernity alongside its locus and logus—local histories/global designs:

> (...) on the one hand, the expansion of the late 15th century, and, on the other, the parallel construction of the imaginary from both within and outside the system. The expression 'historical and local conditions' also refers both to local histories 'within' the modern world system (for example, the local histories of 'metropolitan centers,' the local histories of Europe and the U.S., the local histories of Spain and England) as well as the local histories of its margins/borders (for example, the Andes under colonial rule, the independence of Latin American countries from Spain and the formation of nations under a new global order, the local history of India under British administration, or that of Algeria and Tunisia under French colonialism). (...) Global projects, in other words, are, so to speak, fermented within the local histories of the metropolitan countries; they

> are implemented, exported, and enacted in different ways in specific locations (for example, in France and Martinique in the 19th century).

Although Mignolo develops the concepts of local histories and global designs throughout the book, placing greater emphasis in this passage on what he calls the "planetary and global historical conditions"—it becomes possible to understand that the "local histories of the metropolis" (Mignolo, 2020, p. 97) are always situated within a specific spatiotemporal context. In doing so, Mignolo reiterates the non-universal and non-neutral character of what is identified as global designs, such as the legitimization of colonialism through images and narratives, as well as colonialism itself. This is precisely the danger of Adichie's (2009) single story, which can be traced, in this study, back to the European Renaissance: a local/single (hi)story turned into a global design. The same can be done to Art History: a local history – started, according to this study, with Vasari's work – turned into a global design, that is, into a single story. To reiterate Adichie's words, our point is that if this is a single story merged with Mignolo's local history concept, it means that other stories are missing—or rather, other histories need to (re)surface, transforming a single line into a pluriversal weft.

With that being said, the work developed in the "Renaissances" classroom provides an experimentational and practice-based elaboration and operationalization to the theoretical framework outlined above:

> Besides, as it is demonstrating applications previously made of this methodology by simultaneity, it is worth highlighting the class entitled 'Renaissances,' which has been taught on several occasions, refuting the universality and presumed uniqueness of the European Cultural Renaissance and the narrative of Classical Antiquity – bringing Kemet to the center, offering the classroom (the antiroom), other movements also called renaissances such as Harlem, Mexican and Catalan Renaissance, plus Beyoncé's Renaissance music album (2022), diversifying the understatement of the movements' nomenclature and its numerous possible meanings. In addition, other artistic flourishings that can be, in a intentional approach, temporally and/or epistemologically related and layered to the movement that had its epicenter in Florence were brought too – the Chimu mantle itself and its Culture, Marajoara Pottery and its history, as well as the Ifé and Benin Kingdoms in present-day Nigeria, Mali, Ethiopian and Songhai Empires, Nanbokuchō and Muromachi periods in Japan, the Ming Dynasty in China, the Indian Mughal Empire, and the artistic and cultural expressions of Aztec, Inca and Maya histories. (Leme & Sarzi-Ribeiro, 2025, p. 143)

From the very first implementation of the class and throughout its practical, artistic and theoretical developments/ramifications, the primary motivation was not only to reposition of the Italian/European Renaissance as a local historical phenomenon, but, most importantly, to collectively conceive and create a weft of Renassainces and other art and cultural productions challenging its uniqueness, foregrounding the historical processes that unfolded simultaneously across different parts of the world. This approach fostered a critically intercultural dialogue while also highlighting the dynamics of domination exercised by Europe from the fifteenth century onward. This simultaneity occurred not only in chronological terms but also, one might argue, in etymological and contextual terms: what other "Renaissances" have existed? What artistic, media-based, and technological possibilities emerge from a diverse, pluriversal, and critically intercultural understanding of the Renaissances and also of art(s)? By bringing together diverse types of media, sites and spaces, chronologies, worldviews, and contexts, how many creative and critical possibilities can be collectively made? As the quotation itself

reiterates, the Chimu Mantle (Women of Chimu Culture, 1200–1430, wool, cotton, and pigment, 90 × 85 cm, on loan from MASP Landmann, C.00991) is introduced from the outset as both as an image and a narrative that anticipates this investigation framework. Dating from a period and a place that, even though geographically distant, existed alongside Trecento and Quattrocento, it remains as a key body of work and knowledge for those other histories we aim to tell.

After all, the distinctions between art and craft, and between a work of art and an artifact, are part of the local/single (hi)story/global design of art (Art History), not absolute truths. We must therefore reject the rejection of contemporaneity (Mignolo, 2020) that came with those violent discourses and practices. Remaining in the realm of mantles, cloaks, embroidery, and weaving, another Renaissance emerges: The Renaissance lace. Although it was originated as a European style of lace-making and craft during the Italian/European Renaissance, since the past century it has become a symbol and an important source of income and feminine empowerment for women in the Northeastern (in Portuguese, Nordeste) Region in Brazil, creating dialogical weavings of time and space, that, by resisting linearity, opens spaces for pluriversal knowledges. Continuing the interweaving of this tapestry called Arts' Histories and expanding our notions of Renaissances and arts in general, the excerpt invites to another reading: as it affirms, these questions, first posed in 2022 and revisited once again in the present moment, have opened multiple pathways for investigation. Owing to their diversity and multiplicity, these inquiries remain the subject of ongoing scholarly doctoral investigation, specially the latter cited, but a lot of work has been done.

Beginning with the recognition that multiple renaissances have emerged throughout history, this study highlights those that occurred simultaneously with—or even prior to—the European Renaissance, according to Jack Goody's "Renaissances: The one or the many?" (2011), such as those the author identifies and examines in Islam, India, and China, while also incorporating into this historical bricollage Renaissances situated closer to the contemporary period, such as the Harlem Renaissance, the Mexican Renaissance, the Catalan Renaixença, and Beyoncé's album Renaissance (2022), the first installment of an ongoing musical trilogy. It is important to state that not only other Renaissances were investigated, but also all kinds of artistic and cultural movements around the globe that were contemporarily resonating – temporally or theoretically speaking – with the one that brought to art history books names like Michelangelo and Botticelli.

Furthermore, it is crucial to say that, beyond references like Goody (2011), Adichie (2009), and Mignolo (2020), the discussion and knowledge built by Jacques Ferreira Pinto's article (2019), "Black Art for Teaching the European Cultural Renaissance: An Honest Discussion of Modernity," which reports excellent pedagogical practices and experiences conducted in 2018 with the first-year high school students at the Federal University of Rio de Janeiro's Laboratory School (CAp UFRJ), particularly on Renaissance lessons and course, drawing on the decolonial concepts of epistemological disobedience and critical interculturality, putting in perspective the linear history and other histories that were suppressed by the first one, since "it is impossible to separate the Renaissance movement in modern European history from concurrent issues related to the processes of colonization in the Americas and the transatlantic enslavement of Africans" (Pinto, 2019, p. 2). was of great importance to the work carried out in the classroom during the Renaissances proposal/antiroom. The author describes pedagogical practices and lessons in which the European Renaissance bodies of work are placed in dialogue with the work of the contemporary Afro-Cuban artist, Harmonia Rosales, incorporating discussions and

(an)other artistic practices into the classroom, relating European Renaissance from a critical standpoint within Afrodiasporic Art.

From the present day to ancient times, combining what was brought about Kemet on the excerpt (Leme & Sarzi-Ribeiro, 2025) with the Chinese Dynasties Song and Ming, especially with the painting styles developed by the three of them, aspects (applied, named and understood in different ways) such as refinement, sense of scale and dimension, attention to technique and detail, and sophistication, have not only existed or emerged from Renaissance Europe: bodies of work like "The garden of Nebamun" (c. 1400 a. C., Mural of a tomb in Thebes, 64 × 74.2 cm; British Museum, London) from Kemet (New Kingdom), placed in dialogue with both Southern and Northern Song Dynasties paintings such as "Five-colored parakeet on a blossoming apricot tree" (Huizong Emperor, 1110–1119), also adding the white and blue chinese porcelain, this pluriversal pedagogical weaving changes perceptions of art history knowledges, amplifying them.

Since we are talking about ceramics, extending chinese white and blue porcelain, influenced deeply by Song palace painting (Yang, 2022), which dynasty is considered what can be called a Renaissance (Goody, 2011), we can also bring the Marajoara Pottery to the conversation, a correlation that has been developed as a result of the doctoral thesis, for example. Following on those movements, for instance, the more contemporary Renaissances above-mentioned, can represent the very contemporary artistic engagements and investigations on feminist, LGBTQIAPN+, anti-racism, pro-Blackness, Indigenous and anti-ableist movements, since the relationships among territories, cultures, emancipation, diversity in sexuality and gender, and historical, aesthetic, and artistic landmarks beyond the Global North can be examined not only through these movements in isolation, but also through an understanding of their legacies and mutual influences. This became evident in the Harlem Renaissance and its connections with ballroom culture decades later, as well as in the cinema, poetry and music of African American artists, including Beyoncé. In these reflections, we are not establishing cause-and-effect relationships or teleological interpretations among the movements and the connections depicted, but rather weaving together possibilities for plural dialogues among them, highlighting their distinct legacies through meaningful associations and correlations. Also, talking about LGBTQIAPN+ movements throughout history, especially bisexuality and bisexual artists, connections between the Harlem and Mexican Renaissances artistry and figures can be done, specifically with names like Frida Kahlo, Josephine Baker, Billie Holiday and Bessie Smith.

Conclusion

As we have seen, the Renaissances have only just begun. These remain countless possibilities for artistic, pedagogical, and epistemological connections capable of fostering broader and more diverse forms of learning, especially during periods in the Global North history when colonial notions of truth, universality, and beauty were conveyed through images, narratives, and practices of dehumanization and violence. From a spatiotemporal perspective, the Arts' Histories, as a methodological pluriversal proposal, begin with the Renaissances. Yet, if time is understood as an organic weft rather than a linear route, much has been already investigated and explored, while much more remains to be done in relation to the critical intercultural dialogues proposed in this study. As further developments, we intend to establish further and deeper connections among not only the Renaissances and other artistic and cultural movements explored here, but also with Marajoara Pottery, as mentioned earlier, and the India Mughal Empire, Ifé and Benin Kingdoms in present-day Nigeria, Mali, Ethiopian and Songhai Empires,

Nanbokuchō and Muromachi periods in Japan, as well as Aztec, Inca and Maya histories, as contained in the last excerpt of the article. We believe these connections will lead to associations and possibilities yet not fully explored and known, revealing historical frameworks that gravitates outside the European single/local (his)tory, and, perhaps, another Renaissances.

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

We attest that the sole use of these technologies, specifically for the abstract, was to, as permitted, enhance the language and legibility of the previously author-written text, since English is not the author's first language. The program used was ChatGPT 5.5. After using these tools, the text was reviewed and edited by the author, who takes full responsibility for what was written and critically articulated. No further use of AI or modifications to the concepts and critical points in this article were made.

References

Adichie, C. N. (2009, July). *The danger of a single story*.

Candy, L. (2006). Practice based research: A guide. *CCS report*, *1*(2), 1–19.

do Nascimento Nganga, J. G. (2021). Harlem Renaissance: "Morrer para nascer e escrever a partir de si" [Harlem Renaissance: To die in order to be born and write from oneself]. *Revista História: Debates e Tendências*, *21*(2), 117–129.

Federici, S. (2023). *Calibã e a bruxa: mulheres, corpo e acumulação primitiva* [Caliban and the witch: Women, the body and primitive accumulation]. Editora Elefante.

Fialho, C. S. (2025). *Gender and sexuality in art education: A view through visual culture education and the queer perspective* [Undergraduate thesis, São Paulo State University, Faculty of Architecture, Arts and Communication].

Filho, G. (n.d.). *Com grande produção no Cariri, renda renascença cresce na moda mundial* [With major production in the Cariri region, Renaissance lace gains prominence in global fashion]. Cariri Ligado. https://www.caririligado.com.br/com-grande-producao-no-cariri-renda-renascenca-cresce-na-moda-mundial/

Gombrich, E. H. (1995). *The story of art* (16th ed., expanded and redesigned). Phaidon Press.

Goody, J. (2010). *Renaissances: The one or the many?* Cambridge University Press.

Grosfoguel, R. (2006). Del final del sistema-mundo capitalista hacia un nuevo sistema-histórico alternativo: la utopística de Immanuel Wallerstein [From the end of the capitalist world-system toward a new alternative historical system: Immanuel Wallerstein's utopistics]. *Nómadas*, (25), 44–52.

Grosfoguel, R. (2016). A estrutura do conhecimento nas universidades ocidentalizadas: racismo/sexismo epistêmico e os quatro genocídios/epistemicídios do longo século XVI [The structure of knowledge in Westernized universities: Epistemic racism/sexism and the four genocides/epistemicides of the long sixteenth century]. *Sociedade e estado*, *31*, 25–49.

Kelly-Gadol, J. (1977). Did women have a Renaissance? In R. Bridenthal & C. Koonz (Eds.), *Becoming visible: Women in European history* (pp. 174–201). Houghton Mifflin.

Kothari, A., Salleh, A., Escobar, A., Demaria, F., & Acosta, A. (Eds.). (2022). *Pluriverso: Um dicionário do pós-desenvolvimento* [Pluriverse: A post-development dictionary]. Editora Elefante.

Lafont, A., Ledbury, M., Thompson, K., Wat, P., & Weller, O. (2017). L'histoire de l'art à l'aune de la fiction. Pour une extension du domaine de la recherche: Une discussion entre Mark Ledbury, Krista Thompson, Pierre Wat et Olivier Weller, menée par Anne Lafont [Art history in light of fiction: Extending the field of research. A discussion between Mark Ledbury, Krista Thompson, Pierre Wat, and Olivier Weller, moderated by Anne Lafont]. *Perspective, 2017*(1), 31–46. https://doi.org/10.4000/perspective.7078

Leme, I., & Sarzi-Ribeiro, R. (2025). Arts' Histories: Simultaneity as a Methodological Approach. *The European Conference on Arts & Humanities 2025: Official Conference Proceedings* (pp. 139–147). https://doi.org/10.22492/issn.2188-1111.2025.14

Lozano, L.-M. (2023). *Frida Kahlo* (45th ed.). TASCHEN.

Matias, A. (2025). Como Gilberto Gil se reinventou em Refazenda — e mudou a música brasileira [How Gilberto Gil reinvented himself in Refazenda—and changed Brazilian music]. *Rolling Stone Brasil*. https://rollingstone.com.br/musica/como-gilberto-gil-se-reinventou-em-refazenda-e-mudou-a-musica-brasileira/

Mignolo, W. D. (2020). *Local histories/global designs: Coloniality, subaltern knowledges, and border thinking* (2nd ed.). Duke University Press.

The Museum of Modern Art. (n.d.). *Mexican muralism*. https://www.moma.org/collection/terms/mexican-muralism

Nelson, R. (2013). *Practice as research in the arts: Principles, protocols, pedagogies, resistances*. Palgrave Macmillan.

Nogueira, C. (n.d.). *Renda renascença*. Mulheres que Tecem Pernambuco. https://mulheresquetecempe.com.br/arte/renda-renascenca/

The Palace Museum. (n.d.). *Collection*. Retrieved July 14, 2026, from https://intl.dpm.org.cn/collection_list.html

Pinto, J. F. (2019). Arte negra para o ensino do Renascimento Cultural europeu: uma discussão honesta sobre a modernidade [Black art for teaching the European Cultural Renaissance: An honest discussion on modernity]. *Revista Encontros*, *17*(32), 2–16.

Programa do Artesanato Paraibano. (n.d.). *Renda renascença* [Renaissance lace]. https://pap.pb.gov.br/artesaosparaibanos/renda-renascenca

Rebello Magalhães, A. M., Magalhães de Oliveira, P. R., Sarzi Ribeiro, R. A., Du Aguiar Leme, I., & Bazzo Francisco, R. (2023). El activismo curatorial y las historias del arte y el vídeo: mundos caleidoscópicos [Curatorial activism and the histories of art and video: Kaleidoscopic worlds]. *Cuadernos del Centro de Estudios de Diseño y Comunicación*, *26*(191).

Santana, I. V. (2025). *The contribution of Afro-Brazilian art to the construction of children's and adolescents' identities* [Bachelor's thesis, Universidade Estadual Paulista]. https://hdl.handle.net/11449/318695

Souto, V. R. (2022). *A Refazenda de Gilberto Gil: Uma interpretação* [Gilberto Gil's Refazenda: An interpretation]. In *Anais do XXXI Congresso da ANPPOM*.

Victoria and Albert Museum. (2024, April 17). *Chinese blue-and-white ceramics*. https://www.vam.ac.uk/articles/chinese-blue-and-white-ceramics

Walsh, C. (2005). Interculturalidad, conocimientos y decolonialidad [Interculturality, knowledge, and decoloniality]. *Signo y pensamiento*, *24*(46), 39–50.

Walsh, C. (2010). Critical interculturality and intercultural education. *Construyendo interculturalidad crítica, 75*(96), 167–181.

Walsh, C. (2019). Interculturality and decoloniality of power: an “other” way of thinking and positioning based on colonial difference. *Revista Eletrônica da Faculdade de Direito de Pelotas, 5*(1).

Walsh, C., De Oliveira, L. F., & Candau, V. M. (2018). Coloniality and decolonial pedagogy: Thinking about a different kind of education. *Education Policy Analysis Archives, 26*, 83. https://doi.org/10.14507/epaa.26.3874

Wu, Z. (2024). *On the connection and differences between Song Dynasty art and Renaissance art*. *Chinese Traditional Culture, 12*(1), 57–61. https://doi.org/10.12677/CnC.2024.121009

Yang, Q. (2022). *The influence of imperial painting in Song Dynasty on Chinese ceramic art*. *Art and Design Review, 10*, 198–203. https://doi.org/10.4236/adr.2022.102014

AI Chatbots for Critical Literacy in Education: Perspectives From UX Experts and Educators

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Abstract

This study examines stakeholder perspectives on TouriBot, an AI-supported chatbot integrated into a gamified educational application. The chatbot was implemented within "Fake News Travels Fast," a challenge-based learning environment that encourages students to critically evaluate misleading online tourism content and engage more thoughtfully with digital information. The evaluation included three stakeholder groups: in-service primary school ICT teachers, ICT educational advisors serving as institutional pedagogical experts and UX experts. The data were analyzed using Framework Analysis to identify areas of agreement and divergence among the three stakeholder groups. The findings reveal broad agreement regarding the importance of Socratic questioning, age-appropriate interaction and guided prompts in supporting student engagement and critical thinking. At the same time, participants expressed differing views concerning students' readiness to use AI-supported tools and the extent to which the chatbot should be integrated into the learning flow of the gamified environment. UX experts also identified several interaction design concerns, including visual clutter, limited contextual responsiveness and the need for supportive emotional feedback mechanisms. The study emphasizes the significance of creating AI-enhanced learning environments that foster questioning, reflection, and active assessment of digital content. The findings are valuable to the ongoing dialogue about the role of AI in education, providing practical insights for designing chatbot-assisted critical literacy activities tailored for younger learners.

Keywords: educational chatbots, critical digital literacy, gamification, primary education

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Introduction

The contemporary digital environment increasingly exposes primary school students to misleading, exaggerated, or fabricated online content. Although misinformation is not a new phenomenon, digital platforms have intensified its visibility and circulation, making it more difficult for young users to distinguish reliable information from distorted or manipulated content (Tandoc et al., 2017). This issue is especially relevant in tourism, where idealized representations of destinations are common across social media, influencer content, and travel platforms, often shaping expectations in ways that may be difficult to identify critically (Fedeli, 2020). For primary school students, whose cognitive and media literacy skills are still developing, such exposure creates a need for educational approaches that support critical interpretation, credibility assessment, and reflective engagement with online information (Potter, 2010).

In response to growing concerns about misinformation, media and news literacy education increasingly emphasizes the importance of helping students evaluate sources, question credibility, and think critically about digital content (Jones-Jang et al., 2021). However, educators often face challenges in integrating these skills into everyday classroom practice, particularly as digital and AI-supported learning environments continue to evolve (Ku et al., 2023). Gamified learning environments may offer a promising response to this challenge by combining structured learning tasks with interaction, challenge, and engagement (Deterding et al., 2011). Their motivational potential is often linked to Self-Determination Theory, which highlights autonomy, competence, and relatedness as central conditions for meaningful engagement in learning (Ribeiro Silva et al., 2024; Ryan & Deci, 2017).

This study examines "Fake News Travels Fast," a gamified educational application designed to help primary school students develop critical digital literacy through tourism-related misinformation scenarios. The application includes TouriBot, an AI chatbot that supports students as they ask questions, reflect on information, and consider whether online content is trustworthy. Educational chatbots can support communication, guidance, and learner engagement when designed to promote meaningful interaction rather than simply provide answers (Chee et al., 2023). In this context, the study explores how Information and Communication Technology (ICT) teachers, ICT educational advisors, and User Experience (UX) experts perceive TouriBot's role, usability, and educational value within a gamified learning environment.

Literature Review

As digital media grows quickly, it is changing how young people find, understand, and use information online. More and more, children come across content that is misleading, edited, or exaggerated on social media, online videos, and feeds shaped by algorithms. This problem stands out in areas like tourism, where perfect-looking images, influencer posts, and marketing stories can create unrealistic ideas and expectations (Fedeli, 2020). Misinformation has always existed in various forms, but digital platforms have made it more visible and easier to access. As a result, it is now harder for younger users to distinguish reliable information and misleading content (Tandoc et al., 2017).

In this setting, critical digital literacy is now a key goal in education. Media literacy experts say students need more than just technical skills. They also need to judge credibility, understand persuasive messages, and think carefully about the information they find online

(Potter, 2010). Recent studies show that teaching news literacy and misinformation can help students think more critically and act more responsibly online (Jones-Jang et al., 2021). However, many educators continue to report uncertainty about how to effectively integrate critical literacy skills into classroom practice, particularly in relation to rapidly evolving AI-supported technologies and digital communication environments (Ku et al., 2023).

Gamified learning environments are receiving increasing attention as effective ways to boost participation and engagement in education. Instead of just delivering information, gamification uses challenges, rewards, interaction and storytelling to help students take a more active role in learning (Deterding et al., 2011). The educational value of gamification is often linked to Self-Determination Theory, which emphasizes autonomy, competence, and relatedness as key psychological needs that influence motivation and engagement (Ryan & Deci, 2017). When integrated meaningfully into learning activities, gamified approaches may support both motivation and reflective learning practices (Ribeiro Silva et al., 2024).

Artificial Intelligence (AI) tools are now more common in education. Educational chatbots, in particular, help with communication, guidance, and personalized learning. Research shows that chatbots can boost student engagement, accessibility, and participation, especially when their conversations are designed to support learning instead of just giving answers (Chee et al., 2023). Voice-based and AI-supported chatbot systems have also demonstrated potential in supporting primary school learners through interactive educational activities (Elmaadaway et al., 2025).

Finally, recent discussions increasingly emphasize the importance of designing AI-supported educational tools that encourage questioning, reflection, and critical engagement rather than passive content consumption. In this context, conversational scaffolding and Socratic-style interaction are considered particularly important for supporting critical thinking and reflective learning processes (Paul & Elder, 2008; Vygotsky, 1978). Although interest in AI-supported learning environments is increasing, there is still not much research on how different stakeholder groups view the educational role, usability, and integration of AI chatbots in gamified critical literacy, especially in primary schools. This study aims to address this gap by looking at stakeholder perspectives on TouriBot, an AI chatbot used in a gamified misinformation-detection app for young learners.

Methodology

Research Approach

This study used participants' responses to open-ended questionnaire items. ICT teachers and ICT educational advisors were asked about three main topics: how the chatbot could better help students develop critical thinking and spot misinformation, how ready students are to use the chatbot and what affects this readiness, and what difficulties students might face when using the system. UX experts answered a mandatory question about the chatbot's conversational style, including its personality and tone, how natural its guidance felt, and how the dialogue and user engagement could be improved. We analyzed these qualitative responses to find common themes, concerns, and suggestions for improving the system's design and educational use. Data were collected through a structured questionnaire used exclusively as a vehicle for eliciting qualitative responses. No quantitative analysis of survey items was conducted; the study is entirely qualitative in orientation.

Participants

The study employed a multi-stakeholder sample comprising three distinct groups. First, ICT teachers working in primary education provided qualitative feedback through open-ended questionnaire items. Second, ICT educational advisors who support curriculum implementation and teacher development responded to the same questionnaire. Third, UX experts with experience in educational technology and interaction design were invited to evaluate the chatbot's interface, conversational flow, and overall user experience.

Data Collection

In the sample of ICT educators, the open-ended questions were optional rather than mandatory, unlike those for the other two smaller groups, the ICT advisors and the UX experts. ICT teachers could choose whether to answer the open-ended questions, since the qualitative part was meant to support, not to determine, the overall evaluation. In contrast, all ICT educational advisors and UX experts provided qualitative responses, as these were a main source of evidence. The questionnaire included three open-ended questions designed to collect qualitative data regarding: (a) ways to foster critical thinking through the chatbot, (b) the extent to which students are prepared to use it effectively and the factors influencing this and (c) potential difficulties observed during interaction with the chatbot. The qualitative analysis was conducted exclusively on the responses of participants included in the final sample (N = 112), excluding incomplete responses, failed responses to the honesty-check item and participants who did not meet the inclusion criteria for the study The ICT advisors (N = 13) answered the same mandatory questions. UX experts were asked to answer one mandatory open-ended question about the chatbot’s perceived personality, communication tone, the naturalness of the interaction, and possible improvements to the dialogue flow. All participants (N = 8) provided responses, which were analyzed thematically.

Theoretical Grounding

The three questionnaire areas were designed with reference to specific theoretical frameworks, which are elaborated below. This grounding informed both the formulation of the open-ended items and the thematic framework subsequently applied in analysis.

The first area concerned strategies for enhancing the chatbot's support of the learning process, particularly with respect to misinformation detection and critical thinking. This dimension drew on two complementary theoretical traditions. First, Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) informed the focus on scaffolding: the chatbot was conceptualized as a mediating tool capable of supporting students in performing tasks they could not yet accomplish independently, provided that interaction is appropriately calibrated to the learner's current level of understanding (Vygotskij, 1978). Second, the Socratic and maieutic tradition of pedagogical questioning in which the teacher's role is not to transmit knowledge but to elicit and refine the learner's own reasoning provided the rationale for exploring whether and how the chatbot could adopt a dialogic rather than declarative stance (Paul & Elder, 2008). This section prompted participants to consider how the chatbot might foster critical thinking rather than simply providing ready-made answers.

The second area examined participants' perceptions of students' preparedness to interact with the chatbot. This theme was theoretically grounded in two contrasting perspectives within the literature on young learners and digital technology. Prensky's (2001) cited concept of the

“digital native” suggests that children who have grown up with digital technology possess an intuitive facility with digital tools. According to this perspective, minimal preparation may be sufficient for chatbot interaction (Prensky, 2001). However, this characterization has been substantially critiqued, as scholars argue that digital familiarity does not automatically translate into digital competence or critical engagement (Bennett et al., 2008). Potter's (2010) framework of media literacy offers a more nuanced perspective by emphasizing the cognitive and metacognitive skills required for meaningful engagement with AI-generated content, such as source evaluation, bias recognition, and reflective questioning. Consequently, the questions in this section prompted participants to consider not only students' technical readiness but also their capacity for the higher-order thinking necessary for effective chatbot use.

The third area examined potential barriers and challenges, such as technical issues, unclear instructions, and confusion arising from the chatbot's communication. This part was based on Sweller's (1988) Cognitive Load Theory, which separates cognitive load into intrinsic load (related to the content's complexity), extraneous load (related to poor instructional design), and germane load (related to building mental frameworks) (Sweller, 1988). In a gamified application for primary school students, both the game mechanics and the chatbot create cognitive demands at the same time. The questionnaire in this area asked participants to think about whether the chatbot's design might increase extraneous load, for example, through unclear prompts, unpredictable responses, or interface features that distract from the main learning task.

Qualitative data from UX experts were gathered using a required open-ended question about the chatbot’s conversational qualities. Participants were asked to assess its personality, communication tone, how naturally it guided users, and the flow of the conversation. They could also suggest ways to improve the chatbot.

Data Analysis

Qualitative data were analyzed using Framework Analysis (Ritchie & Spencer, 1994), a structured analytical method originally developed for applied policy research and particularly well-suited to studies involving multiple stakeholder groups. Framework Analysis comprises five key stages: familiarization with the data, construction of a thematic framework, indexing (coding), charting, and mapping and interpretation (*Richie Spencer Qualitative Data Analysis For Applied Policy Research*, n.d.). This approach enabled systematic comparison of perspectives across the three participant groups and facilitated the identification of both convergent and divergent themes.

Results

Analytical Framework

The following table presents the thematic framework matrix derived from the Framework Analysis, summarizing the key themes identified across the three stakeholder groups.

Table 1
Analytical Framework Matrix: Themes Across Stakeholder Groups

Theme	ICT Teachers	ICT Educational Advisors	UX Experts
Socratic & Exploratory Dialogue	Socratic questioning; suggested prompts	Active intervention in each phase	Natural dialogue flow; encourage reflection
Insufficient Integration into Learning Flow	Auto-display; mandatory use	Disconnected; overly generic responses	----
User Guidance & Scaffolding	Suggested prompts; pre-set question options	----	Suggested prompts; encouragement messages
Student Readiness & Access	Optimistic – digital natives	Cautious – metacognitive maturity required	----
Technical Failures	Not available; delay; UX input issue	----	Decorative elements cause confusion
Pedagogical Appropriateness (Ages 9–12)	Realistic scenarios; authentic sources	Information verification strategies	Lighter tone; example-based language

Convergences: Where Stakeholders Agree

Across all three groups, participants converged on Socratic scaffolding as a core design principle for TouriBot. Rather than providing direct answers or validating students' conclusions, all stakeholders agreed that the chatbot should pose guiding questions that prompt students to think critically. For example, one ICT teacher suggested that "*the chatbot could ask students questions instead of providing ready-made answers,*" while an ICT educational Advisor argued that "*TouriBot should move beyond simply providing answers and instead encourage students to question and search for the truth.*" This finding aligns with established research on guided discovery learning and the role of questioning in developing higher-order thinking skills.

There was also universal approval of an age-appropriate tone for the chatbot. ICT educators, advisors, and UX experts all supported using a friendly, encouraging persona, combined with visual elements such as emojis, which were seen as suitable and engaging for children aged 9 to 12. A UX expert pointed out that "*TouriBot has a very friendly tone*" and noted that the use of emojis was *"particularly important for children aged 9–12."*

Additionally, both ICT teachers and UX experts independently recommended the inclusion of pre-set suggested question options. These were viewed as a practical mechanism for reducing student hesitation, particularly for those who struggle to formulate their own queries, while keeping interaction focused on the learning activity. As one UX expert suggested, TouriBot *"could display possible questions for students to choose from,"* a feature that could help younger users initiate dialogue more easily.

Divergences: Contrasting Priorities

A notable divergence emerged between ICT teachers and ICT educational advisors regarding student readiness. ICT teachers expressed an optimistic view, characterizing students as digital natives who are generally prepared for chatbot interaction and who require only brief

introductory instructions. ICT educational advisors, by contrast, adopted a more cautious position, arguing that effective use of the chatbot demands four distinct competencies: tool handling, task comprehension, question formulation, and critical evaluation of the chatbot's responses. This difference in perspective has significant implications for how teachers are trained to introduce the tool and how student preparation is scaffolded within the lesson.

A second divergence concerned the chatbot's integration into the gamified learning flow. ICT teachers recommended that TouriBot should appear automatically within each activity and that its use should be made mandatory, citing evidence that students tend to underuse the tool when it is optional. In contrast, ICT educational advisors, were less concerned with the frequency of use and more with the quality of the integration. As one ICT educational advisor observed, the chatbot "*...the chatbot appears too generic and disconnected from the learning process, as it does not recognize at which stage of the activity the student needs support.*" This suggests a design tension between mandating engagement and ensuring that engagement is educationally meaningful.

UX Perspective: Interaction Design

UX experts offered a distinct set of observations focused on interaction design and interface usability. A key concern raised by this group was the presence of unnecessary visual elements within the chatbot interface. One UX expert summarized this concern, noting that "*the graphics are attractive, but some decorative elements may confuse users.*" Experts cautioned that decorative design features, while aesthetically appealing, can distract young users from the primary dialogue and introduce cognitive load that interferes with learning. Their recommendation was to streamline the interface in order to foreground the conversational interaction.

UX experts also emphasized the importance of emotional feedback mechanisms, recommending the use of positive reinforcement messages such as affirmations of effort to support student motivation and persistence. For example, one expert suggested adding brief encouragement messages such as *"Good effort!"* to support motivation and persistence. This recommendation is consistent with broader principles of user-centered design in educational technology, which recognize the motivational role of feedback in sustaining engagement.

From Knowledge Provider to Critical Friend

A particular theme in the data from ICT educational advisors was the recommendation to reposition TouriBot from a knowledge-providing tool to what they described as a "maieutic tool," one that draws out students' own reasoning rather than supplying answers. Rather than confirming or refuting claims about fake news scenarios, the chatbot should prompt students with questions such as "*Why do you think this source is credible*?" or *"Did you notice the missing publication date*?" This approach actively engages students' critical literacy skills and prevents the passive reception of information that can undermine the educational goals of the intervention.

Discussion

The findings of this study indicate several important dimensions of chatbot integration in gamified educational environments. The convergence around Socratic scaffolding across all three stakeholder groups suggests that there is strong professional consensus on the

pedagogical value of question-based interaction in supporting critical thinking. This is consistent with existing research on the role of guided interaction in digital learning environments and reinforces the theoretical foundation of the "Fake News Travels Fast" application.

The divergence regarding student readiness highlights a gap between educators' experiential confidence in students' digital competence and advisors' more theoretically grounded concerns about metacognitive demands. This tension may reflect different professional perspectives: ICT classroom teachers observe students' facility with digital devices on a daily basis, while ICT advisors are more attuned to the deeper cognitive skills required for meaningful critical engagement with AI tools. Bridging this gap will require more explicit pedagogical preparation, including the development of structured activities that build students' capacity to formulate questions and evaluate chatbot responses critically.

The concern raised by both ICT educational advisors and UX experts about the chatbot's limited contextual awareness points to a fundamental design challenge. For TouriBot to serve as an effective scaffold within the gamified environment, its responses must be sensitive to the specific challenge the student is working on and to the particular misinformation scenario under investigation. Generic responses, however friendly in tone, reduce the chatbot to a decorative element rather than a functional pedagogical tool.

The UX experts' emphasis on reducing visual noise and providing emotional feedback reflects a broader principle in educational technology design: that interface complexity should not exceed the cognitive resources available to the target user group. For primary school children, the conversational interface must be simple, predictable, and effectively supportive.

It is important to consider several limitations when interpreting the qualitative findings. Since the open-ended questions were optional for ICT teachers, the response rates for the three questions ranged from about 28% to 35%. As a result, the views shared here might not reflect the perspectives of all teachers in the sample. Those who provided qualitative feedback may have held stronger opinions or greater interest in using the chatbot for educational purposes. Furthermore, these opinions do not lead to conclusions regarding learning outcomes and do not constitute data from classroom experiments.

Conclusion

This study explored what stakeholders think about an AI chatbot used in a gamified educational setting to help primary school students develop critical literacy. Qualitative findings, based on voluntary open-ended responses from ICT teachers and mandatory responses from ICT educational advisors and UX experts revealed six main themes: Socratic and exploratory dialogue, integration into the learning process, user guidance and support, student readiness and access, technical reliability, and whether the tool is suitable for the target age group. The results show where professionals agree and where they differ, which affects how educational chatbots should be designed, used, and introduced in classrooms. The study especially points out the need for chatbots to respond to context, provide clear teaching support, and better match their features to specific learning goals. This research has some limitations. It does not include data from students, so the findings reflect only adult professionals' views on how students might use the tool. Future research should collect feedback directly from students, utilizing both quantitative data and personal narratives to gain a clearer understanding of how TouriBot impacts learning.

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

The author declares that Grammarly, an AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from Grammarly, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Bennett, S., Maton, K., & Kervin, L. (2008). The 'Digital Natives' Debate: A Critical Review of the Evidence. *British Journal of Educational Technology*, *39*. https://doi.org/10.1111/j.1467-8535.2007.00793.x

Chee, K. N., Abdul Rahman, M. H., Yahaya, N., Ibrahim, N., ABDUL RAZAK, R., & Sugino, C. (2023). Exploring the Trend and Potential Distribution of Chatbot in Education: A Systematic Review. *International Journal of Information and Education Technology*, *13*, 516–525. https://doi.org/10.18178/ijiet.2023.13.3.1834

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining 'gamification'. *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, MindTrek '11*, 9–15. https://doi.org/10.1145/2181037.2181040

Elmaadaway, M. A. N., El-Naggar, M. E., & Abouhashesh, M. R. I. (2025). Improving Primary School Students' Oral Reading Fluency Through Voice Chatbot-Based AI. *Journal of Computer Assisted Learning*, *41*(2), e70019. https://doi.org/10.1111/jcal.70019

Fedeli, G. (2020). 'Fake news' meets tourism: A proposed research agenda. *Annals of Tourism Research*, *80*, 102684. https://doi.org/10.1016/j.annals.2019.02.002

Jones-Jang, S. M., Mortensen, T., & Liu, J. (2021). Does media literacy help identification of fake news? Information literacy helps, but other literacies don't. *American Behavioral Scientist*, *65*(2), 371–388. https://doi.org/10.1177/0002764219869406

Ku, K., Fung, T., Au, A., Choy, A., Kajimoto, M., & Song, Y. (2023). Helping young students cope with the threat of fake news: Efficacy of news literacy training for junior-secondary school students in Hong Kong. *Educational Studies*, 1–19. https://doi.org/ 10.1080/03055698.2023.2296345

Paul, R., & Elder, L. (2008). Critical Thinking: The Art of Socratic Questioning, Part III. *Journal of Developmental Education*, *31*.

Potter, W. J. (Ed.). (2010). *Theory of media literacy: A cognitive approach*. SAGE Publications.

Prensky, M. (2001). Digital Natives, Digital Immigrants Part 1. *On the Horizon*, *9*, 1–6. https://doi.org/10.1108/10748120110424816

Ribeiro Silva, L., Maciel Toda, A., Chalco Challco, G., Chamel Elias, N., Ibert Bittencourt, I., & Isotani, S. (2024). Effects of a collaborative gamification on learning and engagement of children with Autism. *Universal Access in the Information Society*. https://doi.org/10.1007/s10209-024-01119-w

Ritchie, J., & Spencer, L. (1994). Qualitative data analysis for applied policy research. In A. Bryman & B. Burgess (Eds.), *Analyzing qualitative data* (pp. 173–194). Routledge. https://doi.org/10.4324/9780203413081-10

Ryan, R. M. et Deci, E. L. (2017). Self-determination theory. Basic psychological needs in motivation, development and wellness. Guilford Press. *Revue Québécoise de Psychologie*, *38*, 231. https://doi.org10.7202/1041847ar

Sweller, J. (1988). Cognitive Load During Problem Solving: Effects on Learning. *Cognitive Science*, *12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4

Tandoc, E., Lim, Z., & Ling, R. (2017). Defining "Fake News": A typology of scholarly definitions. *Digital Journalism*, *6*, 1–17. https://doi.org/10.1080/21670811.2017.1360143

Vygotskij, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds). Harvard University Press.

AI-Integrated Task-Based Language Teaching for Low-Proficiency EFL Learners: A Longitudinal Mixed-Methods Study

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Abstract

This longitudinal mixed-methods study investigated how AI-integrated Task-Based Language Teaching (TBLT) supported speaking development, affective change, and learner engagement among low-proficiency English as a Foreign Language (EFL) learners in a technology-enhanced learning environment. Fourteen adult learners (CEFR A1–A2) in a continuing education context participated in a two-semester intervention incorporating AI tools for speaking practice, feedback, pronunciation support, and task-based rehearsal. Given the small sample size and non-normal data distribution, non-parametric analyses were conducted. A Friedman test revealed a statistically significant difference in speaking performance across four time points, $\chi^2(3, N = 14) = 19.57$, $p < .001$, with a moderate-to-large effect size (Kendall's W = .47). Post-hoc Wilcoxon signed-rank tests indicated significant within-semester improvements in both Semester 1 ($Z = -2.51$, $p = .012$, $r = .67$) and Semester 2 ($Z = -2.64$, $p = .008$, $r = .71$). In Semester 1, speaking-related anxiety significantly decreased ($Z = -3.18$, $p = .001$, $r = .85$), while confidence increased significantly ($Z = -2.94$, $p = .003$, $r = .79$), both with large effect sizes. In contrast, motivation showed small-to-moderate positive changes in Semester 2, although these did not reach statistical significance. Qualitative reflections further suggested that AI-integrated rehearsal and iterative speaking practice reduced anxiety, enhanced learner confidence, and increased engagement in classroom activities. These findings suggest that AI-integrated TBLT can create technology-enhanced learning environments that support longitudinal speaking development, affective regulation, and sustained learner engagement among low-proficiency EFL learners.

Keywords: AI-integrated language learning, technology-enhanced learning, task-based language teaching (TBLT), longitudinal mixed-methods study, speaking development, learner engagement

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Introduction

Artificial intelligence (AI) and educational technology are increasingly being utilized to support language learning by providing opportunities for interaction, feedback, and self-paced practice (Huang et al., 2022; Qiao & Zhao, 2023; Zou et al., 2025). In EFL contexts, these technologies have attracted growing attention for supporting speaking development, particularly among lower-proficiency learners who benefit from guidance and repeated opportunities to communicate. However, speaking remains one of the most challenging language skills because learners must process and produce language in real time (Newton & Nation, 2020; Skehan, 2018). Many learners also experience speaking anxiety, fear of negative evaluation, and low confidence, which can reduce participation and willingness to communicate (Alageel & Altalhab, 2024; Horwitz et al., 1986; Khajavy et al., 2018; MacIntyre & Gardner, 1994; MacIntyre et al., 1998; Ozdemir & Papi, 2022; Woodrow, 2006). These difficulties may be especially noticeable among adult learners in continuing education, who often have limited study time and fewer opportunities to use English outside the classroom (Hwang et al., 2024; Laila et al., 2023; Qiao & Zhao, 2023; Robah & Anggrisia, 2023; Shen & Chiu, 2019; Usman & Mahmud, 2024; Yessenbekova, 2024; York et al., 2021).

Task-Based Language Teaching (TBLT) emphasizes meaningful communication through authentic speaking tasks and repeated task cycles (Ellis et al., 2019; Sharmin, 2023; Skehan, 2018). AI tools, including automatic speech recognition (ASR), text-generation systems, and multimodal learning platforms, can support these processes by providing opportunities for practice, feedback, and rehearsal (Chen et al., 2024; Fathi et al., 2024; Hwang et al., 2024; Zhou et al., 2025). Previous studies have reported improvements in fluency, pronunciation, confidence, and willingness to communicate in AI-supported environments (Zhang et al., 2024), although findings related to learners' emotional experiences remain mixed (El Shazly, 2021; Huang et al., 2022). In addition, much of the existing research focuses on short-term interventions, with limited attention to low-proficiency adult learners and long-term changes in speaking performance, anxiety, and motivation. To address these gaps, this study examined speaking development, affective change, and learner engagement among low-proficiency adult EFL learners across two consecutive semesters of AI-integrated TBLT.

Literature Review

Speaking Development in AI-Integrated Task-Based Language Teaching Contexts

Speaking development is the gradual improvement in learners' ability to use fluent, intelligible, and appropriate language in real-time interaction. In this case, to quickly process vocabulary, encode the syntax of words in a reading passage, organize discourse units, and exert phonological control (Newton & Nation, 2020; Skehan, 2018). Task-based language teaching (TBLT) involves cycles of pre-task preparation, task performance, and post-task reflection that provide opportunities for speaking development. These cycles provide repeated opportunities for meaningful language use and the gradual development of fluency and accuracy (Ellis, 2009; Ellis et al., 2019; Hsu, 2017; Long, 2015). Recent research suggests that AI-supported tasks can help learners practice, revise, and refine their spoken output. A recent meta-analysis reported a large overall effect of generative AI integration on speaking performance (Hedges' $g = 0.72$), indicating positive effects on learners' oral production (Li et al., 2026). Empirical studies have shown that AI-supported activities, including role-play tasks, interactive drills, automatic speech recognition (ASR) chatbots, and virtual conversational companions, can improve speaking performance and willingness to communicate while providing additional

opportunities for speaking practice (Chen et al., 2024; Fathi et al., 2024; Guan et al., 2024; Hwang et al., 2024; Jeon et al., 2023; Zhou et al., 2025). These environments often incorporate multimodal features, such as textual support, spoken audio, and AI-generated feedback, allowing learners to practice at their own pace and refine their spoken output as needed through repeated practice. This may be particularly beneficial for low-proficiency learners who require additional support and repeated practice to develop speaking skills (Guan et al., 2025).

Although there is increasing evidence that generative AI can enhance L2 speaking performance within TBLT contexts (Chen et al., 2024; Fathi et al., 2024; Hwang et al., 2024; Li et al., 2026; Yang et al., 2022), several limitations persist. Most AI-TBLT studies emphasize short-term interventions, and relatively few examine longitudinal speaking development or learners' long-term progress (Li et al., 2026). Qualitative findings reveal that some learners discontinue autonomous AI speaking practice over time due to motivational or environmental constraints (Guan et al., 2025). Furthermore, adult learners in continuing education contexts are underrepresented in the literature (Li et al., 2026; Zhou et al., 2025), and AI interventions generally produce smaller effects for lower-proficiency learners compared to more advanced peers (Li et al., 2026). Therefore, additional longitudinal research is required to determine how AI-integrated instructional environments support sustained speaking development among low-proficiency adult learners. To address this gap, the present study investigated growth in speaking across two consecutive semesters of AI-integrated task-based learning.

Speaking Anxiety and Confidence in AI-Integrated Adult EFL Learning

Speaking anxiety is a critical affective factor influencing oral performance in EFL contexts. Horwitz et al. (1986) conceptualized foreign language anxiety as a situation-specific construct involving communication apprehension, test anxiety, and fear of negative evaluation, all of which are salient in speaking tasks. Building on this framework, this study adopted Park's (2014) FLCAS model, which operationalizes speaking-related anxiety as communication apprehension regarding understanding and confidence. Closely related constructs, including willingness to communicate and confidence, further explain speaking behavior, as learners' willingness to communicate is influenced by self-confidence, perceived competence, and anxiety (MacIntyre et al., 1998).

AI-integrated and technology-mediated environments have increasingly been examined as forms of affective scaffolding that may reduce psychological barriers to oral participation. Such environments can offer low-pressure, flexible, and individualized learning conditions that foster confidence, enable self-paced rehearsal, provide repeated speaking opportunities, and enhance willingness to participate (Bashori et al., 2024; Tania et al., 2025; York et al., 2021). These affordances are particularly relevant for adult EFL learners in continuing education, who often experience limited study time, work responsibilities, and heightened awareness of linguistic limitations. However, recent reviews indicate that adult learners and non-traditional teaching contexts remain underrepresented in the literature (Tania et al., 2025). Furthermore, most affective studies have employed short-term or cross-sectional designs, with limited attention to the progression of anxiety and confidence alongside speaking development over time (Gao, 2022; Toyama & Yamazaki, 2021). To address this gap, the present study adopts a longitudinal perspective to examine the co-development of speaking performance and affective change in an AI-integrated task-based learning context.

AI-Assisted Scaffolding, Repeated Practice, and Pronunciation Support

While previous research has emphasized AI's role in reducing affective barriers, less attention has been given to how AI functions as a structured pedagogical system for scaffolding, repeated practice, and iterative rehearsal. From a sociocultural perspective, scaffolding enables learners to perform beyond their current level through guided support within the Zone of Proximal Development (Mingyan et al., 2025; Vygotsky, 1978). In AI-integrated environments, such support can be operationalized through GenAI, teacher feedback, and iterative revision. Generative AI tools can assist learners in generating scripts, adjusting linguistic complexity, and refining language through multiple rounds of revision and adaptive speaking tasks (Kooti et al., 2025; Rahman & Brime, 2025). When combined with teacher guidance on content accuracy and pronunciation, this hybrid scaffolding system supports linguistic development and communicative appropriateness (Aliakbari et al., 2025; Khan et al., 2025), suggesting that AI effectiveness depends on pedagogically aligned integration rather than isolated use of the tool (Sutrah et al., 2025).

AI technologies also support repeated practice and pronunciation development, both of which are essential for speaking growth. Automatic speech recognition (ASR) systems allow learners to rehearse spoken output repeatedly and receive immediate feedback on segmental and suprasegmental features (Al-husban, 2025; Bashori et al., 2024; Chen et al., 2022; Dennis, 2024; Sormin et al., 2025; Sutrah et al., 2025), while systematic review evidence identifies pronunciation as the most consistently improved speaking sub-skill in AI-assisted environments (Sutrah et al., 2025). This is important because repeated practice supports automaticity and fluency in L2 speaking (Nation, 2007; Thornbury, 2005). Multimodal AI-integrated environments further enable learners to combine textual, visual, and auditory resources, making speaking a recursive process of drafting, practicing, revising, and re-performing spoken output (Li et al., 2026), which aligns with TBLT principles of authentic, goal-oriented communication (Ellis et al., 2019; Long, 2015; Makhlouf, 2021). However, limited research has examined AI as an integrated scaffolding system within longitudinal task-based instructional design; therefore, this study examined how AI-integrated scaffolding, pronunciation support, and iterative speaking practice contributed to longitudinal speaking development and affective change among low-proficiency adult EFL learners.

Motivation and Engagement

In technology-enhanced language learning, particularly within AI-assisted environments, motivation and engagement are important for sustaining speaking development. AI tools can enhance engagement through interactive task design, adaptive learning pathways, and immediate personalized feedback, supporting self-paced and repeated practice (Nguyen, 2024; Qiao & Zhao, 2023; Zou et al., 2025). By increasing opportunities for participation, rehearsal, and learner autonomy, AI-integrated environments may strengthen learners' sense of control and sustained involvement in speaking activities. Such environments may also promote self-regulated learning by allowing learners to control the pace, frequency, and timing of speaking practice (Zimmerman, 2002).

Motivation should also be considered alongside speaking performance and anxiety because oral communication is cognitively demanding and anxiety-inducing (Hwang et al., 2024). Even in technology-enhanced environments, speaking anxiety, low motivation, and fear of failure may persist (Qiao & Zhao, 2023; Zhang et al., 2024). Sustained speaking development may therefore depend not only on linguistic improvement, but also on learners' ability to maintain

motivation, engagement, and confidence over time, particularly when they perceive autonomy, task value, and control over learning (Ryan & Deci, 2020). However, few longitudinal studies have examined how motivation, engagement, and speaking development co-evolve within AI-integrated instructional environments, highlighting the need for mixed-methods research that captures both performance outcomes and learners' socio-affective experiences over time.

Research Gap

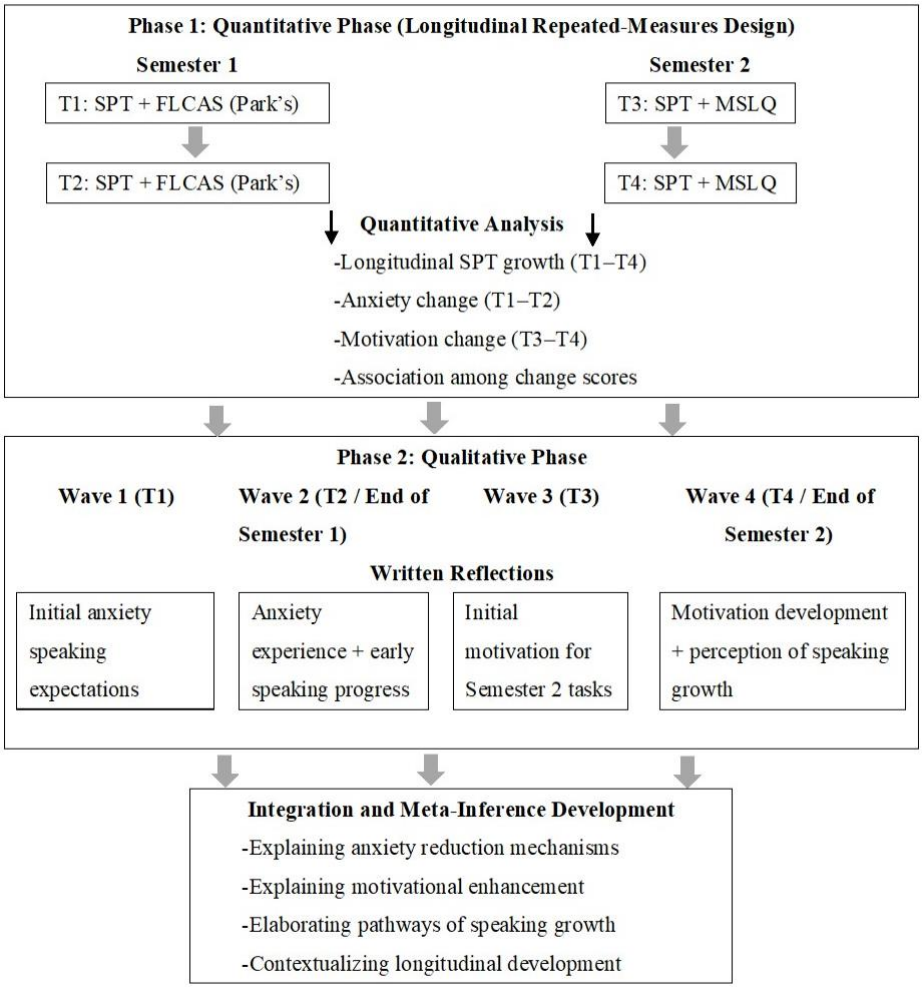
Despite growing interest in AI-assisted language learning and task-based instruction, longitudinal research remains limited on how speaking performance, anxiety, and motivation co-develop within AI-integrated learning environments, particularly among low-proficiency adult EFL learners. To address this gap, this study investigated these changes across two semesters using a mixed-methods approach to examine how AI-integrated instructional design supported speaking development, affective regulation, and learner engagement over time. The following research questions guided the study:

1. To what extent did low-proficiency adult EFL learners demonstrate longitudinal speaking development within an AI-integrated task-based learning environment?
2. To what extent did learners' speaking-related anxiety and confidence change during AI-integrated task-based learning in Semester 1?
3. To what extent did learners' motivation and engagement change during AI-integrated task-based learning in Semester 2?
4. How do learners' written reflections explain the longitudinal development of speaking performance, anxiety, motivation, and engagement across the two semesters?

Method

A longitudinal explanatory sequential mixed-methods design was employed to investigate speaking development, affective change, and learner engagement within an AI-integrated task-based learning environment. Quantitative data were gathered over two semesters to monitor changes in speaking performance, anxiety, and motivation. On the other hand, qualitative data were collected through written reflections at four distinct time points to explain learners' developmental experiences. The design was QUAN-dominant, with qualitative data providing explanatory support, and findings were integrated during the interpretation phase to generate meta-inferences. Figure 1 demonstrates the overall research design.

Figure 1
Longitudinal Explanatory Sequential Mixed Methods Design of the Study



Participants and Context

The participants were 14 adult English as a Foreign Language (EFL) learners with low English proficiency who were enrolled in a continuing education English course at a university in southern Taiwan. Participants' proficiency levels ranged from CEFR A1 to A2. The course was conducted once a week for two 45-minute sessions. The AI-integrated environment provided flexible speaking practice, feedback, and task-based activities beyond the traditional classroom context. Most participants remained in the study for both semesters, allowing for data collection at multiple time points.

Instructional Design and Procedure

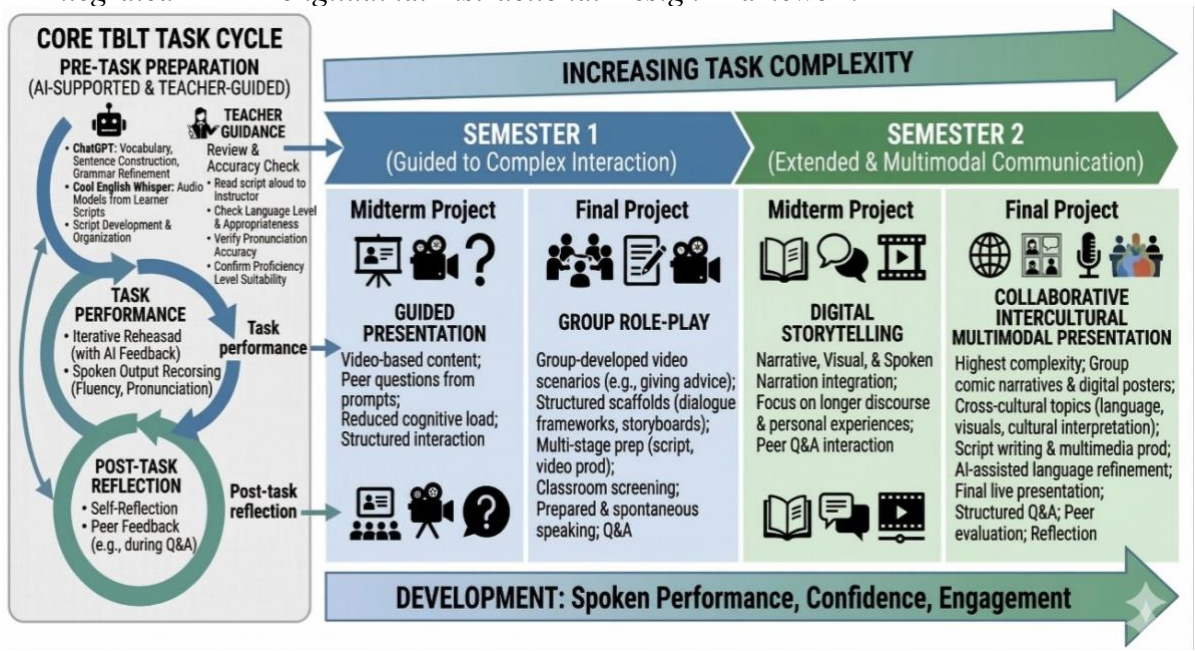
An AI-integrated Task-Based Language Teaching (TBLT) framework was implemented across two consecutive semesters to support longitudinal speaking development and affective change. The instructional design followed repeated task cycles consisting of pre-task preparation, task performance, and post-task reflection. During the pre-task phase, learners used ChatGPT for vocabulary development, sentence construction, grammatical refinement, and script organization. Teacher guidance was provided to ensure language appropriateness and pronunciation accuracy. Pronunciation support was further provided through the Cool English

platform developed by the Ministry of Education in Taiwan, which integrates Whisper-based automatic speech recognition to analyze learners' spoken input and provide pronunciation feedback. During task performance, learners produced spoken output through presentations, role-plays, storytelling, and multimodal projects. In the post-task phase, learners revised and rehearsed their spoken output through AI-supported feedback, recordings, and self-reflection.

Each semester included midterm and final project-based speaking tasks with increasing complexity. In Semester 1, learners completed a guided video-based presentation with a simulated Q&A session, followed by a group role-play project supported by dialogue frameworks, storyboards, script development, rehearsal, and classroom screening. In Semester 2, learners completed a digital storytelling task using StoryJumper, combining narrative structure, visual design, text, images, and recorded audio. The final project required a collaborative intercultural multimodal presentation using tools such as Pixton to create comic-based narratives and digital posters on cross-cultural topics. Across the two semesters, the tasks progressed from guided speaking to independent, multimodal, and intercultural communication, supporting development in speaking performance, confidence, and engagement. Figure 2 illustrates the AI-integrated TBLT instructional design, including task cycles, AI-integrated processes, and the progression of project-based tasks.

Figure 2

AI-Integrated TBLT Longitudinal Instructional Design Framework



Instruments

Speech Performance Test (SPT)

Speaking performance was assessed using the Speech Performance Test (SPT), which is embedded in the MyET system. The SPT is an AI-based automated speech evaluation tool that analyzes oral production through speech recognition and acoustic features, generating scores for pronunciation accuracy, fluency, and overall speech quality. The test produces raw item scores from 0 to 100, which are converted into a four-point rating scale based on performance bands and then summed to produce an overall speaking score aligned with CEFR proficiency levels. Scores were collected at four time points: T1, T2, T3, and T4. In addition to formal

assessment, the SPT was used during the first 10 minutes of each class as a regular practice activity, providing learners with ongoing opportunities for feedback, monitoring, and speaking practice.

Foreign Language Classroom Anxiety Scale (FLCAS)

Speaking-related anxiety was measured using the Foreign Language Classroom Anxiety Scale (FLCAS; Horwitz et al., 1986). The scale was operationalized based on Park's (2014) two-factor structure, and the adapted version comprised 23 items representing communication-related anxiety. The instrument was administered at two time points (T1 and T2) to examine changes in speaking-related anxiety. Minor wording adjustments were made to align the items with the speaking-focused context. The scale demonstrated high internal consistency at both time points (Pre: Cronbach's $\alpha = .92$; Post: Cronbach's $\alpha = .90$).

Motivated Strategies for Learning Questionnaire (MSLQ)

Learner motivation was measured during Semester 2 using selected subscales from the MSLQ (Pintrich et al., 1991). Four motivation components were included: intrinsic goal orientation, task value, control of learning beliefs, and self-efficacy for learning and performance. These subscales were selected because they capture learners' interest, perceived task value, beliefs about effort-based learning, and confidence in their learning abilities, which are particularly relevant in task-based speaking instruction contexts. The MSLQ was administered at two time points (T3 and T4) to examine changes in learner motivation during Semester 2.

The selected subscales demonstrated excellent internal consistency at both time points (Pre: Cronbach's $\alpha = .99$; Post: Cronbach's $\alpha = .98$). Subscale reliabilities ranged from .93 to .98 at T3 and from .84 to .95 at T4, indicating strong internal consistency across constructs, although some subscales showed very high values that may suggest overlap among items.

Written Open-Ended Reflections

Given that the participants were adult learners enrolled in a continuing education program, instructional time was limited to two 45-minute sessions per week. As a result, it was not feasible to conduct additional qualitative data collection methods, such as interviews, outside of regular class time. To address this constraint, written reflections were employed as the primary qualitative data source. Reflection prompts were administered at four key points throughout the study: the midterm and final examinations of Semester 1, and the midterm and final examinations of Semester 2. These reflections were designed to capture learners' perceptions of classroom activities, as well as their experiences related to speaking performance, anxiety, and motivation over time.

Data Collection and Analysis

For the quantitative phase, analyses were conducted using SPSS (Version 27). Given the small sample size ($n = 14$) and potential non-normality, non-parametric tests were employed. Longitudinal speaking development (T1–T4) was examined using the Friedman test, followed by Wilcoxon signed-rank tests for pairwise comparisons. Changes in speaking-related anxiety (T1–T2) and motivation (T3–T4) were also analyzed using Wilcoxon tests. Effect sizes (r) were calculated, and associations among change scores were examined to explore relationships between speaking development and affective variables.

For the qualitative phase, data were collected through four waves of written reflections at the midterm and final of each semester. The data were analyzed using thematic analysis (Braun & Clarke, 2006) with an inductive approach to identify patterns related to confidence, anxiety, engagement, and perceived improvement. The themes were then integrated with quantitative findings for explanatory purposes.

Results

Longitudinal Speaking Development

Descriptive statistics for SPT scores across four time points are presented in Table 1. Mean SPT scores increased from 67.64 (SD = 29.29) at the beginning of Semester 1 (T1) to 91.00 (SD = 39.74) at the end of Semester 1 (T2). Scores continued to rise at the beginning of Semester 2 (T3; M = 101.86, SD = 49.30) and reached 117.79 (SD = 44.70) by the end of Semester 2 (T4). Overall, learners demonstrated an approximate 50-point increase in mean SPT scores from T1 to T4.

Table 1
Descriptive Statistics for SPT Scores Across Four Time Points (N = 14)

Time Point	M	SD	Min	Max
T1	67.64	29.29	16	130
T2	91.00	39.74	24	158
T3	101.86	49.30	18	173
T4	117.79	44.70	39	190

Note. T1 = Beginning of Semester 1; T2 = End of Semester 1; T3 = Beginning of Semester 2; T4 = End of Semester 2. SPT = Speaking Proficiency Test

A Friedman test revealed a statistically significant difference in speaking performance across the four time points, $\chi^2(3, N = 14) = 19.57$, $p < .001$, with a moderate-to-large effect size (Kendall's W = .47). Post-hoc Wilcoxon signed-rank tests further showed significant within-semester improvements from T1 to T2 ($Z = -2.51$, $p = .012$, $r = .67$) and from T3 to T4 ($Z = -2.64$, $p = .008$, $r = .71$), both indicating large effect sizes. Mean SPT scores increased progressively across all four time points, with learners demonstrating an approximate 50-point increase from T1 to T4. These findings indicate sustained speaking development across the two-semester instructional period.

Changes in Speaking Anxiety and Confidence (Semester 1)

Descriptive statistics for the two FLCAS factors are presented in Table 2. For Communication Apprehension (Factor 1), mean scores decreased from 42.71 (SD = 13.34) at pretest to 31.50 (SD = 8.65) at posttest. In contrast, for the confidence-related dimension (Factor 2), mean scores increased from 36.57 (SD = 6.95) to 44.00 (SD = 2.39), indicating an improvement in learners' perceived speaking confidence.

Table 2
Descriptive Statistics for FLCAS Factor Scores at Pretest and Posttest (N = 14)

Factor	Pretest		Posttest	
	M	SD	M	SD
F1 (Communication Apprehension)	42.71	13.34	31.50	8.65
F2 (Communication Apprehension and Confidence)	36.57	6.95	44.00	2.39

Note. FLCAS = Foreign Language Classroom Anxiety Scale; F1 = Communication Apprehension; F2 = Confidence-related dimension. Higher scores on F1 indicate higher levels of speaking anxiety, whereas higher scores on F2 indicate greater speaking confidence.

A Wilcoxon signed-rank test revealed a statistically significant reduction in Communication Apprehension from pretest to posttest, Z = −3.18, p = .001, with a large effect size (r = .85). Similarly, a significant increase was observed for the confidence dimension, Z = −2.94, p = .003, with a large effect size (r = .79). Overall, these findings indicate a substantial reduction in speaking-related anxiety accompanied by increased speaking confidence during Semester 1. A summary of inferential statistics across speaking performance, anxiety, and confidence is presented in Table 3.

Table 3
Summary of Inferential Statistics for Changes in Speaking Performance and Speaking-Related Anxiety (N = 14)

Measure	Comparison	Statistic	*p*	Effect Size
SPT	T1–T4	$\chi^2(3) = 19.57$	< .001	$W = .47$
SPT	T1–T2	$Z = -2.51$	.012	$r = .67$
SPT	T3–T4	$Z = -2.64$	.008	$r = .71$
FLCAS F1	Pre–Post	$Z = -3.18$	.001	$r = .85$
FLCAS F2	Pre–Post	$Z = -2.94$	.003	$r = .79$

Note. SPT = Speaking Proficiency Test; FLCAS = Foreign Language Classroom Anxiety Scale; F1 = Communication Apprehension; F2 = Confidence-related dimension; *W* = Kendall's coefficient of concordance; *r* = effect size for Wilcoxon signed-rank tests.

Learning Motivation and Engagement (Semester 2)

Descriptive statistics for the four motivational constructs are presented in Table 4. As shown, all four constructs demonstrated slight increases from T3 to T4. Intrinsic goal orientation increased from 20.00 (SD = 5.79) to 21.00 (SD = 7.17), while task value rose from 31.21 (SD = 9.07) to 32.36 (SD = 10.90). Control of learning beliefs increased modestly from 22.14 (SD = 4.99) to 22.50 (SD = 5.76), and self-efficacy improved from 38.21 (SD = 11.76) to 40.21 (SD = 10.05). Overall, these results indicate a consistent upward trend in learners' motivational orientation during Semester 2.

Table 4
Descriptive Statistics for Learning Motivation at T3 and T4 (n = 14)

Motivation Construct	T3		T4	
	M	*SD*	*M*	*SD*
Intrinsic Goal Orientation	20.00	5.79	21.00	7.17
Task Value	31.21	9.07	32.36	10.90
Control of Learning Beliefs	22.14	4.99	22.50	5.76
Self-Efficacy	38.21	11.76	40.21	10.05

Note. T3 = beginning of Semester 2; T4 = end of Semester 2. Scores represent summed subscale values from the Motivated Strategies for Learning Questionnaire (MSLQ).

Wilcoxon signed-rank tests were conducted to examine whether the observed differences were statistically significant. As shown in Table 5, none of the motivational constructs demonstrated statistically significant changes. Specifically, intrinsic goal orientation did not show a significant difference ($Z = -1.46$, $p = .146$), nor did task value ($Z = -1.29$, $p = .197$). Similarly, changes in control of learning beliefs ($Z = -0.71$, $p = .478$) and self-efficacy ($Z = -1.18$, $p = .239$) were not statistically significant.

Table 5
Wilcoxon Signed-Rank Test Results for Changes in Learning Motivation

Construct	*Z*	*p*	Effect Size (*r*)
Intrinsic Goal Orientation	-1.455	.146	.39
Task Value	-1.290	.197	.34
Control of Learning Beliefs	-0.709	.478	.19
Self-Efficacy	-1.178	.239	.31

Note. T3 = beginning of Semester 2; T4 = end of Semester 2; *r* = effect size for Wilcoxon signed-rank tests.

Despite the lack of statistical significance, effect size estimates indicated small to moderate practical changes across the motivational constructs ($r = .19–.39$). These findings indicate that, although changes in motivation were not statistically significant, learners demonstrated a consistent pattern of gradual improvement in motivational orientation during Semester 2.

Qualitative Reflections on Speaking Development and Affective Change

To address RQ4, learners' written reflections collected at four time points were analyzed using thematic analysis (Braun & Clarke, 2006). The prompts focused on learners' perceptions of classroom activities, speaking performance, challenges, confidence, and learning experiences. Five themes emerged: increased speaking confidence, reduced anxiety through repeated practice, repetition as a key learning process, AI-integrated learning, and increased engagement. These themes helped explain and contextualize the quantitative findings for RQ1–RQ3.

Theme 1: Increased Speaking Confidence

Across the four reflection points, learners reported increased confidence in speaking English. Students described becoming more willing to speak and more comfortable expressing their ideas over time. For example, one learner stated: "I have become more confident in speaking English, and I hope there will be more opportunities like this in the future" (Interviewee No. 11). Another learner reflected: "I try to be braver, and I actually enjoy this kind of challenge" (Interviewee No. 7). In later reflections, learners also reported improvements in fluency: "I

think I am now quite fluent, and I can understand the content much better" (Interviewee No. 7).

Theme 2: Reduction of Anxiety Through Repeated Practice

Learners frequently described feelings of nervousness and anxiety at the beginning of the course, particularly when required to speak English for the first time. However, many reflections indicated that this anxiety decreased over time. For instance, one learner reported: "It was very stressful to use only English for the first time" (Interviewee No. 6). Another learner described: "Taiwanese students are often afraid to speak English because they are afraid of being corrected, and I am one of them" (Interviewee No. 9). In later reflections, learners reported reduced anxiety: "I feel that it is interesting and I am less anxious now" (Interviewee No. 2).

Theme 3: Repetition and Practice as Key Learning Processes

A recurring theme across all reflection points was the importance of repetition and practice. Learners emphasized that improvement in speaking ability was closely associated with repeated practice. For example, one learner noted: "Through repeated practice and rehearsal again and again, I gradually improved" (Interviewee No. 1). Another learner stated: "Repeating the practice over and over is the most effective way for me" (Interviewee No. 9). Similarly, another learner reported: "By practicing continuously, I can get closer to my ideal performance" (Interviewee No. 6).

Theme 4: AI-Integrated Learning

Another prominent theme was the use of AI tools to support learning. Learners reported using tools such as ChatGPT and pronunciation platforms to assist with vocabulary, translation, and pronunciation. For example, one learner noted: "I used ChatGPT to help translate my Chinese story into English" (Interviewee No. 5). Another learner stated: "I used GPT to support my learning" (Interviewee No. 13). Additionally, learners highlighted the use of pronunciation tools: "I uploaded my script to Cool English to practice pronunciation, and it was very helpful" (Interviewee No. 12).

Theme 5: Increased Engagement and Interest in Learning Activities

Learners frequently described the course activities as interesting, interactive, and different from traditional English classes. Many reflections emphasized enjoyment in classroom tasks. For example, one learner stated: "This class is lively and interesting, and it has increased my interest in learning English" (Interviewee No. 4). Another learner reported: "I found it very interesting, and I was happy when others enjoyed my video" (Interviewee No. 11). Similarly, another learner noted: "This course motivates me more to learn English" (Interviewee No. 4).

Collectively, these themes showed that learners' speaking development, anxiety reduction, and motivation were closely connected. Repeated practice in a supportive environment appeared to increase confidence and reduce anxiety, while AI tools supported rehearsal and language use. Greater engagement in classroom activities also helped sustain participation, suggesting that cognitive and affective development occurred together within the AI-integrated TBLT context.

Discussion

The findings suggested that AI-integrated TBLT may support the speaking development and affective regulation of low-proficiency adult EFL learners through scaffolding, iterative speaking practice, and sustained participation, rather than isolated use of technology.

Longitudinal Speaking Development

The results indicated sustained improvement in learners' speaking performance over the two-semester instructional period. These findings are consistent with previous research that highlights the importance of repeated speaking opportunities, meaningful task engagement, and task-based language teaching (TBLT) cycles of performance and reflection (Ellis et al., 2019; Long, 2015; Nation, 2007; Thornbury, 2005). The findings further corroborate studies suggesting that AI-mediated tasks can facilitate speaking development by offering adaptive support and increased opportunities for communicative practice (Hwang et al., 2024; Zhou et al., 2025). In contrast to many short-term intervention studies, the present research provided longitudinal evidence that AI-integrated TBLT can support speaking development through a structured scaffolding and rehearsal system, which includes AI-assisted script generation, teacher-guided refinement, and automatic speech recognition (ASR)-based pronunciation practice.

Reduction of Speaking Anxiety and Increased Confidence

The findings showed reduced speaking-related anxiety and increased confidence during Semester 1, supporting conceptual perspectives that correlate anxiety, confidence, and willingness to communicate (Horwitz et al., 1986; MacIntyre et al., 1998). This affective change appeared to be related to repeated, low-pressure speaking practice, which allowed learners to rehearse before performing, reduce fear of negative evaluation, and acquire greater control over speaking tasks. This is in line with research suggesting that technology-enhanced environments can lessen affective barriers and promote participation (Duan et al., 2021; York et al., 2021). Rather than resulting solely from AI use, the reduction in anxiety appeared to stem from the pedagogically integrated use of AI within a supportive, task-based environment that emphasized scaffolding, iterative rehearsal, and sustained communicative participation. Over time, these processes may have resulted in increased confidence and greater willingness to communicate among low-proficiency adult EFL learners.

Motivation and Engagement

Although motivational changes were modest and did not reach statistical significance, key findings indicate that AI-integrated TBLT appears to help sustain learner engagement and perceived task value. Increases in task value and self-efficacy reflect growing learner confidence and recognition of the relevance of speaking tasks. Research supports the idea that AI-assisted learning environments motivate learners through interactive, adaptive, and personalized experiences (Qiao & Zhao, 2023; Zou et al., 2025). Qualitative evidence demonstrated increased interest and willingness to participate when the environment was supportive and manageable. AI tools provided self-paced, iterative speaking practice, fostering control and autonomy. Task-based activities boosted the perceived relevance of learning. Collectively, these findings suggest that motivation within AI-integrated TBLT contexts may develop through structured task design, technology-supported rehearsal, and reduced affective

barriers. Such environments may support sustained motivational development among low-proficiency adult EFL learners.

Integrated Findings and Meta-Inferences

The integration of quantitative and qualitative findings demonstrates that speaking development, affective regulation, and learner engagement advanced simultaneously within the AI-integrated TBLT environment. Qualitative data connected improvements in speaking performance and confidence to iterative speaking practice, AI-supported learning, and increased willingness to participate. Furthermore, participants reported elevated interest, greater perceived task value, and sustained participation, despite the absence of significant motivational changes. These results indicate that speaking development was influenced by the interaction of cognitive, affective, and motivational factors.

Meta-inferences indicate that AI-integrated instructional design can serve as a scaffolding and rehearsal system to support sustained oral language development. Low-pressure speaking practice, AI-assisted rehearsal, and teacher-guided refinement contributed to improvements in speaking ability, reduced anxiety, and increased learner confidence. Overall, speaking development in AI-integrated TBLT environments resulted from both technology-based affordances and pedagogically structured opportunities for interaction, rehearsal, and affective support.

Limitations and Future Research

This study has several limitations. The small sample size and focus on low-proficiency adult learners in a continuing education context may limit the generalizability of the findings. Although the study adopted a longitudinal design, it was limited to two semesters, and the longer-term sustainability of speaking development, affective change, and motivational engagement remains unclear. In addition, the study conceptualized AI as part of an integrated instructional environment but did not isolate the effects of individual AI tools or instructional components. Future research should include larger, more diverse samples, extend the duration of the investigation, compare different AI-integrated instructional designs, and examine learner-related variables such as autonomy, digital literacy, and technology acceptance.

Conclusion

The present study examined longitudinal changes in speaking performance, anxiety, and motivation among low-proficiency adult EFL learners in an AI-integrated TBLT context. The findings showed improved speaking performance, reduced speaking anxiety, and modest positive motivational trends, suggesting that AI-integrated TBLT may support both linguistic development and affective regulation. Speaking development appeared to emerge through the interaction of pedagogical scaffolding, technology-supported rehearsal, and sustained learner participation. Rather than functioning as a standalone tool, AI operated as part of an integrated instructional system that supported learners in planning, practicing, revising, and performing speaking tasks.

The findings further suggest that AI is most effective when integrated within a structured TBLT framework rather than used in isolation. AI can support script development, pronunciation practice, and iterative speaking rehearsal, while teachers continue to provide guidance on content, pronunciation, and communicative appropriateness. By combining technological

support with teacher scaffolding, AI-integrated learning environments may extend speaking practice beyond the classroom and create low-pressure opportunities that promote confidence, participation, and willingness to communicate among low-proficiency adult EFL learners.

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

Generative AI tools (e.g., ChatGPT and Gemini) were used to assist with language refinement and the visual design of Figure 2. All content was reviewed and verified by the author, who takes full responsibility for the manuscript.

References

Alageel, S., & Altalhab, S. (2024). Levels and major causes of Saudi students' speaking anxiety in EFL classrooms. *Theory and Practice in Language Studies*, *14*(3), 771–780. https://doi.org/10.17507/tpls.1403.18

Al-husban, N. A. (2025). The impact of AI- assisted language learning tools on augmenting university EFL students' speaking skills in Jordan. *Journal of Applied Learning & Teaching, 8*(1). https://doi.org/10.37074/jalt.2025.8.1.13

Aliakbari, M., Barzan, P., Allahveysi, S. P., & Bakhtiarvand, M. (2025). AI-Powered Chatbots for English Conversation Practice: Impact on Speaking Proficiency. *Technology Assisted Language Education*, Online First. https://doi.org/10.22126/tale.2025.12621.1138

Bashori, M., Van Hout, R., Strik, H., & Cucchiarini, C. (2024). 'Look, I can speak correctly': Learning vocabulary and pronunciation through websites equipped with automatic speech recognition technology. *Computer Assisted Language Learning, 37*(5–6), 1335–1363. https://doi.org/10.1080/09588221.2022.2080230

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chen, A. X., Jia, J. Y., Li, Y. Z., & Fu, L. Y. (2024). Investigating the effect of role-play activity with GenAI agent on EFL students' speaking performance. *Journal of Educational Computing Research, 63*(1), 99–125. https://doi.org/10.1177/07356331241299058

Chen, C., Koong, C., & Liao, C. (2022). Influences of integrating dynamic assessment into a speech recognition learning design to support students' English speaking skills, learning anxiety and cognitive load. *Educational Technology & Society, 25*, 1–14.

Dennis, N. K. (2024). Using AI-Powered Speech Recognition Technology to Improve English Pronunciation and Speaking Skills. *IAFOR Journal of Education, 12*(2), 107–126.

Duan, W., Yamashita, N., Shirai, Y., & Fussell, S. R. (2021). Bridging fluency disparity between native and nonnative speakers in multilingual multiparty collaboration using a clarification agent. *Proceedings of the ACM on Human-Computer Interaction, 5*(CSCW2), Article 435. https://doi.org/10.1145/3479579

Ellis, R. (2009). The differential effects of three types of task planning on the fluency, complexity, and accuracy in L2 oral production. *Applied Linguistics, 30*(4), 474–509. https://doi.org/10.1093/applin/amp042

Ellis, R., Skehan, P., Li, S., Shintani, N., & Lambert, C. (Eds.). (2019). *Task-based language teaching: Theory and practice.* Cambridge University Press.

El Shazly, R. (2021). Effects of artificial intelligence on English speaking anxiety and speaking performance: A case study. *Expert Systems, 38*(3), e12667. https://doi.org/10.1111/exsy.12667

Fathi, J., Rahimi, M., & Derakhshan, A. (2024). Improving EFL learners' speaking skills and willingness to communicate via artificial intelligence-mediated interactions. *System*, *121*, 103254. https://doi.org/10.1016/j.system.2024.103254

Gao, J. (2022). Scales assessing L2 speaking anxiety: Development, validation, and application. *Frontiers in Psychology, 13*, 972671. https://doi.org/10.3389/fpsyg.2022.972671

Guan, L., Zhang, E. Y., & Gu, M. M. (2025). Examining generative AI–mediated informal digital learning of English practices with social cognitive theory: A mixed-methods study. *ReCALL, 37*(3), 315–331. https://doi.org/10.1017/S0958344024000259

Horwitz, E. K., Horwitz, M. B., & Cope, J. (1986). Foreign language classroom anxiety. *The Modern Language Journal, 70*(2), 125–132. https://doi.org/10.1111/j.1540-4781.1986.tb05256.x

Hsu, H. (2017). The effect of task planning on L2 performance and L2 development in text-based synchronous computer-mediated communication. *Applied Linguistics, 38*(3), 359–385. https://doi.org/10.1093/applin/amv032

Huang, W., Hew, K. F., & Fryer, L. K. (2022). Chatbots for language learning—Are they really useful? A systematic review of chatbot-supported language learning. *Journal of Computer Assisted Learning, 38*(1), 237–257. https://doi.org/10.1111/jcal.12610

Hwang, W. Y., Guo, B. C., Hoang, A., Chang, C. C., & Wu, N. T. (2024). Facilitating authentic contextual EFL speaking and conversation with smart mechanisms and investigating its influence on learning achievements. *Computer Assisted Language Learning, 37*(7), 1632–1658. https://doi.org/10.1080/09588221.2022.2095406

Jeon, J., Lee, S., & Choe, H. (2023). Beyond ChatGPT: A conceptual framework and systematic review of speech-recognition chatbots for language learning. *Computers & Education, 206*, 104898. https://doi.org/10.1016/j.compedu.2023.104898

Khajavy, G. H., MacIntyre, P. D., & Barabadi, E. (2018). Role of the emotions and classroom environment in willingness to communicate: Applying doubly latent multilevel analysis in second language acquisition research. *Studies in Second Language Acquisition, 40*(3), 605–624. https://doi.org/10.1017/S0272263117000304

Khan, A., Khattak, S. I., & Shakeel, Z. (2025). Exploring The Impact of Artificial Intelligence on Language Learning and English Communication Skills. *Research Journal for Social Affairs, 3*(5), 863–875. https://doi.org/10.71317/RJSA.003.05.0383

Kooti, M., Abyavi, M., Mombeini, H., & Allahdini, P. (2025). The Impact of AI-Integrated Language Instruction on EFL Learners' Speaking Proficiency, Speaking Anxiety, and Foreign Language Motivation. *Assessment and Practice in Educational Sciences, 3*(3), 1–13. https://doi.org/10.61838/japes.3.3.6

Laila, F. N., Adityarini, H., & Maryadi, M. (2023). Challenges and strategies in teaching English speaking skills to young learners: Perspectives of teachers in Indonesia. *Voices of English Language Education Society, 7*(3), 542–556. https://doi.org/10.29408/veles.v7i3.24030

Li, W., Mohamad, M., & You, H. W. (2025). Integrating automatic speech recognition and automated writing evaluation to reduce speaking anxiety and enhance speaking competence among Chinese EFL learners. *Cogent Education, 12*(1), 2559161. https://doi.org/10.1080/2331186X.2025.2559161

Li, Y., Shadiev, R., & Chiu, T. K. F. (2026). Applying generative artificial intelligence to task-based language teaching and learning: A systematic review and meta-analysis. *TechTrends, 70*, 150–163. https://doi.org/10.1007/s11528-025-01140-7

Long, M. H. (2015). *Second language acquisition and task-based language teaching*. Wiley-Blackwell.

Luan, J. (2023). Research on the reform of translation teaching for English majors by TBLT under the background of AI. *English Language Teaching*, *16*(9), 145. https://doi.org/10.5539/elt.v16n9p145

MacIntyre, P. D., & Gardner, R. C. (1994). The subtle effects of language anxiety on cognitive processing in the second language. *Language Learning, 44*(2), 283–305. https://doi.org/10.1111/j.1467-1770.1994.tb01103.x

MacIntyre, P. D., Clément, R., Dörnyei, Z., & Noels, K. A. (1998). Conceptualizing willingness to communicate in a L2: A situational model of L2 confidence and affiliation. *The Modern Language Journal, 82*(4), 545–562. https://doi.org/10.1111/j.1540-4781.1998.tb05543.x

Makhlouf, M. K. I. (2021). Effect of Artificial Intelligence-Based Application on Saudi Preparatory -Year Students' EFL Speaking Skills at Albaha University. *International Journal of English Language Education, 9*(2), 36. https://doi.org/10.5296/ijele.v9i2.18782

Milon, M. R. K., Ishtiaq, M., Ali, T. M., & Imam, M. S. (2023). Unlocking fluency: Task-based language teaching (TBLT) in tertiary speaking classes - insights from Bangladeshi teachers and students. *ICRRD Journal*, *4*(4), 218–230. https://doi.org/10.53272/icrrd.v4i4.11

Mingyan, M., Noordin, N., & Razali, A. B. (2025). Improving EFL speaking performance among undergraduate students with an AI-powered mobile app in after-class assignments: An empirical investigation. *Humanities and Social Sciences Communications, 12*(1), 370. https://doi.org/10.1057/s41599-025-04688-0

Newton, J. M., & Nation, I. S. P. (2020). *Teaching ESL/EFL listening and speaking* (2nd ed.). Routledge. https://doi.org/10.4324/9780429203114

Nguyen, H. A. (2024). Harnessing AI-Based Tools for Enhancing English Speaking Proficiency: Impacts, Challenges, and Long-Term Engagement. *International Journal of AI in Language Education, 1*(2), 18–29. https://doi.org/10.54855/ijaile.24122

Ozdemir, E., & Papi, M. (2022). Mindsets as sources of L2 speaking anxiety and self-confidence: the case of international teaching assistants in the U.S. *Innovation in Language Learning and Teaching*, *16*(3), 234–248. https://doi.org/10.1080/17501229.2021.1907750

Park, G.-P. (2014). Factor analysis of the Foreign Language Classroom Anxiety Scale in Korean learners of English as a foreign language. *Psychological Reports, 115*(1), 261–275. https://doi.org/10.2466/28.11.PR0.115c10z2

Paul Nation, P. (2007). The four strands. *Innovation in Language Learning and Teaching, 1*(1), 2–13. https://doi.org/10.2167/illt039.0

Qiao, H., & Zhao, A. (2023). Artificial intelligence-based language learning: Illuminating the impact on speaking skills and self-regulation in Chinese EFL context. *Frontiers in Psychology, 14*, 1255594. https://doi.org/10.3389/fpsyg.2023.1255594

Rahman, A. J., & Brime, A. A. (2025). Enhancing EFL Learners' Speaking Skills through AI-Powered Tools: A Quantitative Approach. *Zanco Journal of Humanity Sciences, 29*(SpB), 812–826. https://doi.org/10.21271/zjhs.29.SpB.44

Robah, A., & Anggrisia, N. F. (2023). Exploring challenges and strategies in English speaking among Indonesian university students: A case study of AKM University. *Englisia: Journal of Language, Education, and Humanities, 11*(1), 55–74. https://doi.org/10.22373/ej.v11i1.19156

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Sharmin, M. (2023). Beyond traditional approaches: Exploring task-based language teaching (TBLT) and its impact on Bangladeshi university students' academic writing performance. *ICRRD Journal*, *4*(4), 231–246. https://doi.org/10.53272/icrrd.v4i4.12

Shen, M., & Chiu, T. (2019). EFL learners' English speaking difficulties and strategy use. *English Linguistics Research, 5*(2), 88–102. https://doi.org/10.5296/elr.v5i2.15333

Skehan, P. (2018). *Second language task-based performance: Theory, research, assessment*. Routledge.

Sormin, R. K., Sari, I. P., Purba, A., & Rizki, F. (2025). Implications of AI Based as Learning Media to Improve the Speaking Skill from Perspective Students at STIKOM Tunas Bangsa; Through Mobile Assisted Language Learning. *Journal of Educational Sciences, 9*(4), 2323–2332.

Sutrah, Syair, S. N., Mujahid, K., & Musdalifah. (2025). Artificial Intelligence as an Assisted-Language Learning Tool: A Systematic Review of Its Efficacy in Enhancing Speaking Skills Among EFL Learners. *IDEAS: Journal on Language Teaching and Learning, Linguistics and Literature, 13*(2), 7955–7981. https://doi.org/10.24256/ideas.v13i2.9004

Tania, M., Danim, S., & Yensy, N. A. (2025). Foreign language speaking anxiety: A systematic literature review of research developments and practical implications. *TPM: Testing, Psychometrics, Methodology in Applied Psychology, 32*(3), 850–861. https://tpmap.org/submission/index.php/tpm/article/view/2274

Thornbury, S. (2005). *How to teach speaking*. Longman.

Toyama, M., & Yamazaki, Y. (2021). Classroom interventions and foreign language anxiety: A systematic review with narrative approach. *Frontiers in Psychology, 12*, 614184. https://doi.org/10.3389/fpsyg.2021.614184

Usman, A. H., & Mahmud, A. F. (2024). Addressing low speaking proficiency in EFL students: The impact of integrated teaching strategies in an Islamic education setting. *International Journal of Language Education, 8*(3), 503–519. https://doi.org/10.26858/ijole.v8i3.66493

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Harvard University Press.

Woodrow, L. (2006). Anxiety and speaking English as a second language. *RELC Journal, 37*(3), 308–328. https://doi.org/10.1177/0033688206071315

Yang, H., Kim, H., Lee, J. H., & Shin, D. (2022). Implementation of an AI chatbot as an English conversation partner in EFL speaking classes. *ReCALL, 34*(3), 327–343. https://doi.org/10.1017/S0958344022000039

Yessenbekova, K. (2024). Understanding the dynamics of English-speaking challenges for students in Kazakhstan. *Asian Education and Development Studies, 13*(4), 373–385. https://doi.org/10.1108/AEDS-04-2024-0083

York, J., Shibata, K., Tokutake, H., & Nakayama, H. (2021). Effect of SCMC on foreign language anxiety and learning experience: A comparison of voice, video, and VR-based oral interaction. *ReCALL, 33*(1), 49–70. https://doi.org/10.1017/S0958344020000154

Zhang, C., Meng, Y., & Ma, X. (2024). Artificial intelligence in EFL speaking: Impact on enjoyment, anxiety, and willingness to communicate. *System, 121*, 103259. https://doi.org/10.1016/j.system.2024.103259

Zhou, Q., Hashim, H., & Sulaiman, N. A. (2025). Supporting English speaking practice in higher education: The impact of AI chatbot-integrated mobile-assisted blended learning framework. *Education and Information Technologies, 30*, 14629–14660. https://doi.org/10.1007/s10639-025-13401-2

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice, 41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2

Zou, D., Gu, M. M., & Yu, G. (2025). *Artificial intelligence in English language education: Seeking the balanced cognitive, affective, and behavioural impact. System, 134*, 103783. https://doi.org/10.1016/j.system.2025.103783

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Contextualising Controversy: Narratives of Sensitive Issues in Tunisian, Pakistani and Iranian School Textbooks

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Abstract

How school curricula address sensitive topics remains a persistent challenge in education. While much of the literature focuses on how teachers address controversial issues through classroom pedagogy and discussion-based learning, comparatively less attention has been paid to how such issues are framed in textbooks and other curricular materials, including the ways in which language, imagery, and narrative structure shape their presentation. This paper examines how different national curricula present sensitive or controversial topics and whether these discussions are accompanied by narratives that promote or limit critical reflection and nuanced understanding. The study draws on case studies from national curricula in selected countries in the Middle East and South Asia region, as such state-approved textbooks often play a uniquely authoritative role, with a single textbook per subject and grade typically authored and published centrally by the Ministry of Education. The paper examines how and to what extent sensitive topics such as colonial history, gender, religion and violence, are contextualised in textbooks and learning materials. The findings suggest a consistent pattern: where controversial topics are embedded within broader historical and social contexts, curricular narratives more often emphasise critical reflection and invite consideration of coexistence or reconciliation. Where contextualisation is limited or absent, narratives are typically characterised by polarised perspectives and the normalisation of violence. These patterns suggest that contextualisation provides a key analytical lens for evaluating how curricula engage with controversial issues and their broader alignment with educational standards promoting peace, tolerance, and responsible civic understanding.

Keywords: contextualisation, controversial issues, school textbooks, critical thinking, peace and tolerance education

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Introduction

Sensitive and controversial issues have long formed part of education. Topics such as war, colonialism, religion, political conflict, and gender remain inherently contested because they involve competing interpretations of history, identity, and collective memory. This challenge is particularly significant for young students, whose social identity is still developing. The central question is therefore not whether sensitive issues should be taught, but how they should be framed, contextualised, and understood within educational narratives.

The teaching of sensitive issues has received sustained attention within history education scholarship. Cooper and Nichol (2017) argue that such issues emerge where history and identity intersect, using the metaphor of colliding "tectonic plates" to describe the interaction of competing national, political, religious, and cultural identities (p. 15). Historical controversy arises not simply because the past is disputed, but because different communities construct competing forms of historical consciousness through which they interpret the past, understand the present, and imagine the future.

What constitutes a sensitive issue varies across historical, political, and cultural contexts. Elmersjö and Persson (2023) define such issues as those that "engage students emotionally, and... provoke a reaction from them" (Introduction, para. 2) while Britzman (2003) describes "difficult knowledge" as "representations of social traumas in curriculum and the individual's encounters with them in pedagogy" (p. 755). Dearden (1981) similarly argues that controversy exists where "different viewpoints... exist without there being any contradiction in reason and logic" (pp. 37–44). Together, these perspectives suggest that sensitive issues are both intellectually contested and emotionally significant. Accordingly, this paper uses the terms *sensitive*, *controversial*, and *difficult knowledge* interchangeably to refer to curricular topics that challenge students' understandings of history, identity, and society.

Huijgen et al. (2018) argue that historical contextualisation enables students to develop more nuanced understandings of sensitive issues. Building on this premise, this paper argues that the degree of contextualisation within curricular materials shapes the narratives students encounter, ranging from those that encourage critical engagement, empathy, and coexistence to those that reinforce polarisation and antagonisation of the other. Huijgen et al. identify four principles of contextualisation:

1. Raising Awareness of Presentism: Highlighting the limitations of interpreting past or external phenomena through contemporary assumptions.
2. Reconstructing Relevant Contexts: Enabling an understanding of issues by situating them within their relevant temporal, spatial, and socio-political contexts, thereby reducing simplified interpretations.
3. Using Contextual Understanding to Explain Phenomena: Supporting the development of analytical skills that enable students to use context to explain events by identifying causes, consequences, and underlying dynamics, rather than relying on surface-level or descriptive accounts.
4. Cultivating Empathy and Engagement with Multiple Perspectives: Encouraging an empathetic understanding of diverse actions and circumstances through recognising multiple perspectives and humanising experiences.

Drawing on this framework, the paper examines representations of colonialism, gender, and jihad in state-approved textbooks from Tunisia, Pakistan, and Iran. It argues that contextualisation is a necessary condition for fostering multi-perspectivity and coexistence and

considers the extent to which these narratives align with UNESCO's educational guidelines relating to peace, tolerance, and responsible civic understanding.

The study adopts a qualitative comparative case study based on close textual analysis of representative textbook units. It examines how individual examples function as coherent knowledge units through which students encounter and interpret contested topics. Each example is assessed using Huijgen et al.'s four principles.

This study broadens existing scholarship beyond history education. Colonialism, jihad, family roles, and beauty practices provide valuable case studies because they are historically, religiously, and socially contested issues that require curricula to balance factual content, moral values, and national or religious identities. Their sensitivity makes them particularly suitable for examining how textbooks contextualize controversial topics through historical explanation, ethical reasoning, and social norms. Colonialism in Tunisia and Pakistan reveals how curricula interpret historical injustice and national identity. Jihad in Pakistan and Iran illustrates how religious concepts are explained and situated within broader narratives. Beauty practices and family roles in Tunisia and Iran demonstrate how curricula contextualize evolving social norms, gender expectations, and cultural values. Additionally – like most countries in the Middle East, North Africa, and Southeast Asia – their governments (through the Ministry of Education) not only approves but authors the textbooks, thereby actively shaping historical narratives, civic values, and collective identities to future generations.

Contextualising Colonial Pasts: Tunisia and Pakistan

French colonialism remains one of the most historically and politically sensitive issues in Tunisia. While colonial rule was associated with economic exclusion, land dispossession, political inequality, and discrimination, it also profoundly shaped the country's modern development. Perkins (2014) describes the establishment of the French protectorate as a “turning point of enormous importance” (p. 14), arguing that it transformed Tunisia's political, economic, and cultural institutions. Conversely, Challand (2020) emphasises the enduring legacies of colonial-era violence and racialisation, arguing that these continue to shape social inequality and political life long after independence. The framing of the French colonial period is therefore significant, as it can either reinforce antagonistic and polarising narratives or encourage more nuanced and critical engagement with Tunisia’s complex historical experience.[1]

When assessed through Huijgen et al.'s framework, Tunisian textbooks generally apply the principles of contextualisation in their treatment of the French colonial period, particularly reconstructing relevant contexts (principle 2) and using contextual understanding to explain historical phenomena (principle 3). A Grade 12 History textbook (Lyasīr, n.d.), for example, introduces French colonialism through the political, economic, and social conditions that preceded foreign domination. Rather than portraying colonialism solely as an externally imposed conquest, it presents it as the outcome of a “comprehensive crisis” marked by internal structural economic weakness, declining revenues, foreign debt, political corruption, and

[1] To examine how this sensitive issue is presented in practice, this study analyses textbooks obtained from the National Pedagogical Centre (CNP), ensuring that the analysis reflects official materials currently used in schools. Although the digital textbooks do not specify publication dates, comparison with earlier editions and their acquisition during the 2024–2025 school year indicate that they are current and have undergone little substantive change over time. See Daniel Zisenwine and Itam Shalev, *2025 Tunisian Curriculum: Between Progress and Prejudice*, ed. Madeleine Ferris (London: IMPACT-se, December 2025), 10.

administrative decline. The textbook emphasises that "many factors interacted to produce [this crisis]" (p. 89), encouraging students to understand colonialism as the product of multiple interconnected causes rather than a single event.

Figure 1
Grade 12 History Textbook, p. 89.

أستخلص

المقدمة :

تدرجت أوضاع لإيالة التونسيّة منذ وفاة حمودة باشا سنة 1814 نحو التدهور الّذي تحول إلى أزمة شاملة تزامنت مع إستفحال التسرّب الاقتصادي الأوروبي وقد حاول بعض البايات والمصلحين الحد من ذلك بالقيام بمجموعة من الاصلاحات. فما هي مظاهر هذه الأزمة ؟ وفيم تمثّلت أبرز محاولات الإصلاح ؟

I– أزمة حادّة و شاملة :

1ـ أزمة اقتصاديّة وماليّة خانقة :

أ– **عوامل الأزمة** : تفاعلت عديد العوامل لتفرز أزمة اقتصاديّة وماليّة عميقة وشاملة :

Translation from Arabic:
"Introduction:
The conditions of the Tunisian Beylik have gradually deteriorated since the death of the Hammouda Pasha in the year 1814 toward decline that turned into a comprehensive crisis, coinciding with the worsening of European economic penetration.
[...] Many factors interacted to produce a deep and comprehensive economic and financial crisis [...]."

At one point, the textbook even suggests that "Tunisia's fate was to fall under French or Italian control" (pp. 94–95), portraying colonial domination as part of a wider historical context of imperial expansion rather than solely the product of French actions. This framing reflects the textbook's application of the principle of temporal contextualisation, reflecting an attempt to situate events within their historical context (where imperial expansion was widespread), rather than directly attributing responsibility to unnamed French actors. Colonialism is thus framed more broadly as a product of its historical context rather than the action of a single national actor.

Figure 2
Grade 12 History Textbook, p. 94.

إضاءات

مؤتمر برلين

«في كل الحالات كان مصير تونس الوقوع تحت السيّطرة الفرنسيّة أو الإيطاليّة ... وقد استوجب المصالح الاستراتيجيّة لانقلترا في البحر المتوسط تفضيل سيطرة فرنسا على تونس حتّى تحول دون تحكّم إيطاليا في ضفتي مضيق صقليّة مع ما يمثّله ذلك من تهديد لطريق السويس الحيوي جدا للامبراطوريّة البريطانيّة ...»

Translation from Arabic: "[...] In all cases, Tunisia's fate was to fall under French or Italian control. France responded to Britain's suggestion by hastening to impose its control over Tunisia before Italy, especially to avoid threats to the Suez Canal, which was vital to the British Empire [...]"

It is important to note that when colonialism beyond Tunisia is addressed, Tunisian textbooks present it in strongly negative terms. This is illustrated in the Grade 9 Social Studies textbook (Al-Tlīlī, n.d.), which, following its discussion of Tunisia's "comprehensive crisis," devotes a

section to Algerian resistance against French occupation. Students are instructed to use primary sources to “show France's position on the armed revolution and the policy it adopted toward the Algerian national resistance.” These sources describe French repression, including a “violent air raid” that “kill[ed] 79 citizens… wound[ed] 130, and struck 87 with artillery” (p. 107). Graphic images of dead, injured, and humiliated Algerian civilians reinforce this portrayal, presenting the French as employing excessive force while depicting Algerians primarily as victims of colonial violence. At the same time, the textbook omits major infrastructure projects undertaken during French rule, including the Algiers–Blida railway (Maravall, 2019) and the development of ports in Skikda, (Entreprise Portuaire de Skikda, n.d.) Bône/Annaba, and Philippeville (Hidalgo Castillo & Ducruet, 2017).

Figure 3

Grade 9 Social Studies Textbook, p. 107.

الوثيقة عدد 16 : من مظاهر القمع الفرنسي للمقاومة الوطنية الجزائرية

التعليمة :

بيّن من خلال الوثيقتين15 و 16 موقف فرنسا من الثورة المسلّحة و السياسة التي اعتمدتها تجاه المقاومة الوطنيّة الجزائريّة

الوثيقة عدد 17: حوادث ساقية سيدي يوسف

«– 8 فيفري 1958 – قامت 25 طائرة فرنسية بغارة جويّة عنيفة على قرية ساقية سيدي يوسف و هدّمت ثلاثة أرباع القرية و استشهد 68 مواطنا من بينهم نساء و أطفال و جرح 87.

– 9 فيفري 1958 قدّم مندوب تونس بالمنتظم الأممي مذكّرة إلى الأمين العام للأمم المتّحدة عن هذا الاعتداء.

– 14 فيفري 1958 قدّم السيد المنجي سليم ممثل الجمهوريّة التونسيّة في الأمم المتحدة شكوى تونس إ لى مجلس الأمن.

بعث أمة...و بناء دولةنشر كتابة الدولة للإعلام. تونس 1957 ص86 – 87

Translation from Arabic: “[…] Document No. 17: Events of Sakiet Sidi Youssef, 8 February 1958 – 25 French aircraft carried out a violent air raid on the village of Sakiet Sidi Youssef and destroyed three quarters of the village, killing 79 citizens and wounding 130, and striking 87 with artillery […]”

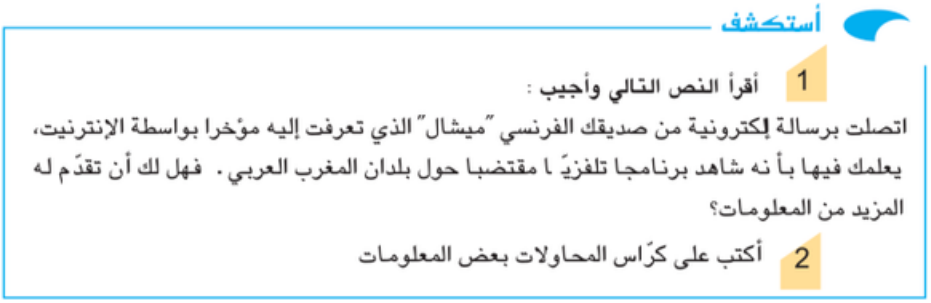
The use of graphic imagery and the emphasis on the disproportionate violence used to suppress Algerian resistance may evoke strong emotional responses, including antagonism towards the French, raising questions about the appropriateness of such material for students of approximately sixteen years of age. Nonetheless, primary sources remain central to contextualisation. Huijgen et al. identify them as essential to reconstructing historical contexts

(principle 2) and cultivating empathy and engagement with multiple perspectives (principle 4). However, as UNESCO (2017) notes, while primary sources can lend "authenticity" and "credibility" to textbooks, they must be "carefully selected" and presented in a "balanced" manner (p. 62). Although graphic evidence of violence can foster empathy with victims, it may also overshadow critical engagement. This illustrates an important limitation of contextualisation: while necessary for developing nuanced understandings of sensitive issues, it does not by itself ensure balanced or age-appropriate engagement. Nevertheless, by situating French repression within the wider history of North African colonialism, the textbook contributes to a more contextualised understanding of French colonial rule.

The examples also reflect a clear distinction between past and present. Rather than extending its critique of colonialism into contemporary antagonism, a Grade 6 Social Studies textbook (Al-Shaṭṭī, n.d.) asks students to write to a "French friend, Michel" about the Arab Maghreb (p. 73). Although intended as a geography exercise, the choice of a French correspondent encourages students to distinguish between the colonial French state and contemporary France, demonstrating awareness of presentism (principle 1). This also reflects UNESCO's (2014) recommendation that textbooks present "personal and cultural identities as fluid, shifting, contextualised and multiple" (p. 16). By separating historical colonialism from present-day relations, the lessons may promote cooperation and coexistence rather than inherited antagonism.

Figure 4

Grade 6 Social Subjects Textbook, p. 73.


أستكشف

1 أقرأ النص التالي وأجيب :

اتصلت برسالة إلكترونية من صديقك الفرنسي "ميشال" الذي تعرفت إليه مؤخرا بواسطة الإنترنيت، يعلمك فيها بأ نه شاهد برنامجا تلفزيّ ا مقتضبا حول بلدان المغرب العربي . فهل لك أن تقدّم له المزيد من المعلومات؟

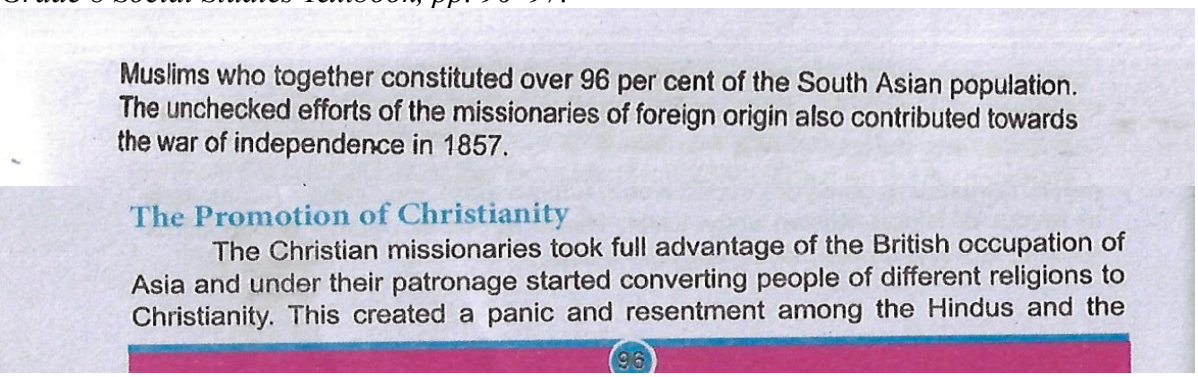
2 أكتب على كرّاس المحاولات بعض المعلومات

Translation from Arabic: "[…] Read the following text and respond: Your French friend Michel, whom you recently met online, sent you a message informing you that he is watching a short television program about the states of the Arab Maghreb countries. Can you provide him with more information? […]"

The Pakistani curriculum presents a different perspective on colonialism. As in Tunisia, British rule is central to understanding the origins of the Pakistani state and national identity, yet its legacy remains contested. Saleem and Rizvi (2011) argue that colonialism introduced administrative institutions while entrenching extractive governance, social inequality, and the decline of local industries and education. By contrast, Moradi et al. (2024) emphasise its contribution to Pakistan's modern state capacity despite its imperial origins. These competing interpretations illustrate that the way colonialism is contextualised in school textbooks especially significant.

Illustrating this point, a Grade 8 Social Studies textbook (Ahmed, 2022) portrays Christian missionary activity during British rule as coercive and socially destabilising, claiming that "the Christian missionaries took full advantage of the British occupation" to convert locals to Christianity, generating "panic and resentment among the Hindus and the Muslims" (pp. 96–97).

Figure 5
Grade 8 Social Studies Textbook, pp. 96–97.



Muslims who together constituted over 96 per cent of the South Asian population. The unchecked efforts of the missionaries of foreign origin also contributed towards the war of independence in 1857.

The Promotion of Christianity

The Christian missionaries took full advantage of the British occupation of Asia and under their patronage started converting people of different religions to Christianity. This created a panic and resentment among the Hindus and the

96

This passage relies primarily on evaluative and emotive assertions rather than evidential explanation. Although its claims regarding missionary activity may be historically grounded, they are presented without the context needed for students to understand the relationships between Christian missionaries, colonial authorities, and local communities. As such, the textbook is silent about the missionary organisations' broader educational and social contributions, including institutions such as Kinnaird College for Women in Lahore (Maskiell, 1985). Instead, missionary activity is subsumed within a narrative of colonial oppression and religious threat. In Huijgen et al.'s terms, the excerpt neglects raising awareness of presentism (principle 1), presenting missionary activity through a contemporary lens that portrays it primarily as religious aggression. Assertions that missionaries "took full advantage" of British occupation and caused "panic and resentment" are offered without evidence or competing perspectives, encouraging a simplified interpretation of colonialism that may foster antagonistic attitudes towards British rule and Christianity.

Contextualising Gender and Social Norms: Iran and Tunisia

In Iran, women's appearance has long been a site of ideological struggle and state intervention. Reza Shah's modernisation reforms of the 1930s, including the banning of veils, the promotion of Western dress, and the expansion of girls' education, sought to secularise Iranian society but were resisted by many religious and conservative communities. Following the 1979 Islamic Revolution, these policies were reversed through compulsory veiling and gender segregation. Afary (2009) argues that "women's bodies became sites of political and cultural struggle" (p. 9), through which the state negotiated morality, religion, and national identity. Consequently, discussions of femininity, appearance, and social norms constitute particularly sensitive—and arguably traumatic—issues, exemplifying what Britzman (2003) describes as "difficult knowledge." As the following analysis demonstrates, Iranian textbooks present these themes with limited contextualisation, reinforcing ideological polarisation and processes of othering.

A Grade 10 Sociology textbook (Intiẓārī, 2024–25), for example, constructs a binary distinction between Western secular and Islamic societies, presenting the former as exclusionary and materially driven while portraying Islamic society as spiritually and morally superior. This framing is made explicit in the claim that "in a secular world, the religious and spiritual identity of individuals cannot have social manifestation and appearance," citing the "prevention of education for veiled girls in some Western societies" as evidence (p. 90).

Figure 6
Grade 10 Sociology Textbook, p. 90.

در یک جهان سکولار، هویت دینی و معنوی افراد نمی‌تواند بروز و ظهور اجتماعی داشته باشد. در این جهان فعّالیت‌هایی که هویت دینی افراد را آشکار کند، منع می‌شوند. برای نمونه، می‌توان به جلوگیری از تحصیل دختران محجّبه در برخی جوامع غربی اشاره کرد.

Translated from Persian: "[…] In a secular world, the religious and spiritual identity of individuals cannot have social manifestation and appearance. In such a world, activities that reveal people's religious identity are prohibited. For example, one can point to the prevention of education for veiled girls in some Western societies […]"

Here, the "secular [Western] world" is constructed through a decontextualised narrative that portrays Western societies as innately hostile to religion while presenting Islamic society as spiritually and morally superior. This characterisation is later supported by the claim that "the law prohibiting the use of hijab in French schools deprives Muslim women wearing hijab of the opportunity for education and employment" (p. 89). Yet the discussion provides almost no legal or historical context-fundamental principles such as *laïcité*, the 1905 law separating church and state, distinctions within French legislation, and Iran's own history of regulating women's dress are all omitted (Beydoun, 2025) Instead, the textbook reinforces its interpretation of the West as uniquely restrictive by juxtaposing it with the French Revolutionary slogan "liberty, equality and brotherhood," (Intiẓārī, 2024–25, p. 89) implying French hypocrisy. Rather than encouraging students to evaluate the historical development and application of French secularism, the lesson promotes a simplified, presentist narrative that generalises the French case to the Western world as a whole.

Figure 7
Grade 10 Sociology Textbook, p. 89.

قانون ممنوعیت استفاده از حجاب در مدارس فرانسه، فرصت تحصیل و اشتغال را از زنان مسلمان با حجاب سلب می‌کند و مغایر شعار معروف انقلاب فرانسه «آزادی، برابری و برادری» است.

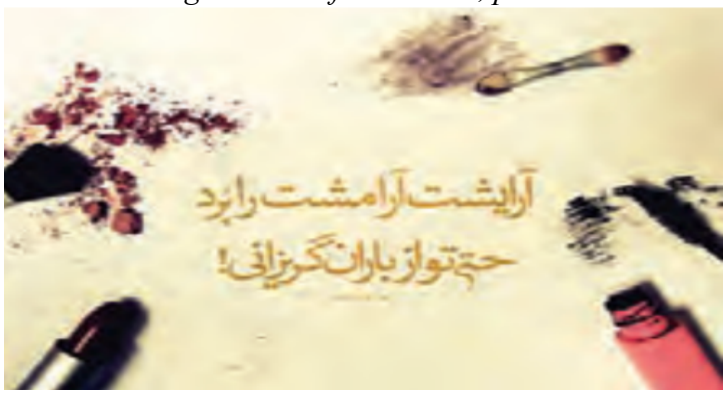
Translated from Persian: "[…] [France's] ban on the hijab in schools deprives Muslim women who wear hijab of opportunities for education and employment. The famous slogan of the French Revolution is 'Liberty, Equality, Fraternity'[…]"

The section also fails to cultivate empathy and engagement with multiple perspectives (Huijgen et al.'s principle 4). As demonstrated in the Tunisian case, meaningful contextualisation requires engagement with primary sources that enable students to examine competing interpretations and lived experiences. Here, however, the only source is an image of a Muslim woman wearing a hijab while protesting, presented as evidence of broad restrictions on the

hijab in France. Yet French law distinguishes between restrictions in specific contexts: the 2004 law prohibits conspicuous religious symbols, including the hijab, in public primary and secondary schools, while the 2010 law prohibits face-covering garments, such as the niqab and burqa, in public spaces (France, 2004, art. 1; France, 2010, art. 1). Rather than situating the discussion within this legal context or presenting alternative perspectives, the image reinforces the textbook's consistent portrayal of the West as hostile towards Islam.

This pattern extends beyond discussions of secularism. A Grade 10 Religion textbook (Āzādī, 2024–25b) presents chastity through a binary between an "ignorant" self and a morally upright, God-centred self before linking these qualities to women's clothing and makeup. Reinforced by the statement "your makeup takes away your peace of mind; you even run away from the rain!" (p. 140), makeup is reduced to a symbol of vanity and moral weakness. Female students are encouraged to monitor their appearance through guilt and shame, presenting modesty as the singular moral ideal and constructing a binary between the virtuous Islamic self and a superficial, Westernised feminine other.

Figure 8
Grade 10 Religion and Life Textbook, p. 140.



Translated from Persian: "[…] Your make-up takes away your peace of mind, you even run away from the rain! […]"

By contrast, Tunisia provides a useful case study for examining representations of gender because debates over women's roles have long been shaped by the interaction between Islamic traditions and the legacy of French colonialism. Rather than completely overriding traditional values, post-independence reforms created an ongoing negotiation between Islamic traditions and social change. Beginning with Habib Bourguiba's 1956 Personal Status Code, successive governments expanded women's legal, educational, and political rights, with further commitments to gender equality reflected in the 2014 Constitution and the 2017 law addressing violence against women (Charrad, 2001). Representations of gender therefore remain politically and culturally significant, making them a useful lens through which to examine how curricula contextualise competing social values.

A Grade 12 Philosophy textbook (Al-Qimāṭī, n.d.) illustrates the curriculum's emphasis on critical inquiry and contextual understanding. In a lesson on prejudice, students are presented with the statement, "Household work is a matter that concerns women" (p. 71), and asked to explain how imitation and habit contribute to this belief before evaluating its dangers. Rather than treating gender stereotypes as natural, the lesson explains them as products of family practices, community expectations, and wider social norms. This reflects Huijgen et al.'s argument that contextualisation requires learners to explain beliefs through their underlying causes before evaluating them (principle 3). At the same time, it encourages students to

recognize that such attitudes are socially learned, fostering empathy without requiring acceptance of prejudice.

Figure 9
Grade 12 Philosophy Textbook, p. 71.

ج - رصد مصادر الأحكام المسبقة

"إنّ المنابع الأساسيّة للأحكام المسبقة هي المحاكاة والعادة والميْل. إنّ للمحاكاة تأثيرا عاما في أحكامنا، ذلك أنّه يوجد سبب قويّ لأن نعتبر حقيقيّا ما أقرّ آخرون أنّه كذلك. ومن ذلك الحكم المسبق التالي: إنّ كل ما يشترك الآخرون في فعله هو حسنٌ. أمّا عن الأحكام المسبقة المتولّدة عن العادة فلا يُمكن أن تستأصل إلا بعد زمن طويل، وذلك حين يرى الذهن أحكامه تنحبس بالتدريج وتُؤجل بفعل بواعث متناقضة، فيجد نفسه، نتيجة لذلك، منقادا إلى نمط مضاد في التفكير. أمّا إذا كان حكم مسبق ما نابعا من العادة وصادرا عن المحاكاة في آن، فإنّ من العسير شِفاء الإنسان منه. ويُمكن للحكم المسبق الناشئ عن المحاكاة أن يسمّى أيضا الميل إلى الاستخدام السلبيّ أو الآليّ للعقل استخداما يحلّ محلّ فعله العفويّ الذي تحكمه قوانين."

امانويل كانط " المنطق " ص 85 وص 86

تمرين أوّل : أستحضر مثالا عن كلّ منبع من منابع الحكم المسبق.

تمرين ثان : أبيّن من خلال الاشتغال على المثال التالي: «العمل المنزلي شأن يخصّ المرأة» تظافر كلّ من المحاكاة والعادة في نشأة الأحكام المسبقة وأقدّر خطورة ذلك.

Translated from Arabic: "[...] Identifying the Sources of Prejudices
The principal sources of prejudices are imitation, habit, and inclination [...]
As for prejudices that arise from habit, they can only be overcome after a long period of time. [...] Using the following example, 'Household work is a woman's responsibility,' show how both imitation and habit contribute to the formation of prejudice, and evaluate the dangers of this [...]"

Contextualising Jihad: Pakistan and Iran

Across much of the MENA region, Islamic Education plays a significant role in shaping religious understanding, moral values, and broader social worldviews. Within Islamic thought, jihad occupies a particularly important position. As Firestone (1999) notes, it has historically influenced "politics and policy, international economics and law, and the self-perception of Muslims and the universal Muslim community as a whole" (pp. 5–6). Although jihad encompasses meanings ranging from spiritual self-improvement to armed struggle (Afsaruddin, 2013), repeated associations with extremist violence have often narrowed public understandings of the concept (Esposito, 2002). Consequently, how jihad is framed in educational materials may significantly shape students' understandings of Islam, conflict, and religious difference. Rather than adjudicating between competing interpretations of jihad, this analysis examines the extent to which curricula contextualise the concept and engage with the diversity of its meanings.

Pakistan provides an important case study because Islam has occupied a central place in national identity and education since independence in 1947. As Jalal (2008) argues, colonial India witnessed the growing politicisation of jihad, linking it to anti-colonial mobilisation and Muslim political identity. Acknowledging this historical context is essential if students are to understand jihad within its broader historical, theological, and legal traditions rather than reducing it to armed violence alone. This is particularly important given research suggesting that some students educated in Pakistan's public-school system express relatively high levels of support for political violence (Fair, 2007). The key question, therefore, is whether school textbooks contextualise jihad in ways that foster historical understanding or instead reinforce a narrower, militarised interpretation.

A Grade 7 Qur'an translation textbook (Malik & Khuda Bakhsh, 2022) illustrates these concerns. It interprets verses 1–6 of Surah Al-'Adiyat, which depict warhorses charging into battle, as exemplifying jihad (p. 105). Muslims believe that the Qur'an is the unaltered word

of God, with many regarding it as applicable to all times and places. Historical contextualisation of jihad is therefore vitally important, since students may otherwise interpret verses revealed within the specific circumstances of seventh-century Arabia as universally endorsing armed struggle. Although the verses themselves do not explicitly mention jihad, the textbook reinforces this interpretation with a hadith (a normative oral tradition) compiled in the authoritative source *Sahih al-Bukhari* stating that "those who ride horses for jihad receive both spiritual rewards and spoils of war." While such interpretations are not uncommon within parts of the Islamic tradition, neither the Qur'anic verses nor the hadith are situated within the historical circumstances of the early Muslim community, when armed conflict formed part of the consolidation of the new religious community. The absence of this context risks limiting students' understanding of the relationship between scripture, history, and later interpretations of jihad.

Figure 10

Grade 7 Qur'an Translation Textbook, p. 105.

اس سورت میں گھوڑوں کی تعریف اس لیے بھی کی گئی ہے کیوں کہ گھوڑا جہاد کا ایک ذریعہ ہے۔ جہاد اسلام
اہم شعبہ ہے۔ جہاد اتنا فضیلت والا عمل ہے کہ جو چیز اس سے وابستہ ہو جاتی ہے وہ بھی فضیلت والی ہو جاتی ہے۔ نبی کر
گھوڑوں کی پیشانی میں قیامت تک کے لیے خیر باندھ دی گئی ہے، ان پر سوار ہو کر جہاد کرنے والوں کو اَجر
ملتا ہے اور مالِ غنیمت بھی۔ (صحیح بخاری: 2852)
وَ الْعٰدِيٰتِ ضَبْحًا ۙ فَالْمُوْرِيٰتِ قَدْحًا
قسم ان (گھوڑوں) کی جو (میدان جہاد میں) تیزی سے دوڑتے ہیں زور سے ہانپتے ہوئے۔ پھر سُم مار کر چنگاریاں نکالنے والے (گھوڑوں کی قسم
فَالْمُغِيْرٰتِ صُبْحًا ۙ فَاَثَرْنَ بِهٖ نَقْعًا ۙ فَوَسَطْنَ
پھر صبح کے وقت حملہ کرنے والے (گھوڑوں) کی (قسم)۔ پھر وہ اس وقت گردوغبار اُڑاتے ہیں۔ پھر وہ اس وقت (دشمن
جَمْعًا ۙ اِنَّ الْاِنْسَانَ لِرَبِّهٖ لَكَنُوْدٌ ۚ وَ اِنَّ
فوج میں گھس جاتے ہیں۔ بے شک انسان اپنے ربّ کا یقیناً بڑا ناشکرا ہے۔ اور بے

Translated from Urdu: "[…] In this Surah, horses are praised because they serve as a means of carrying out jihad. Jihad is a significant branch of Islam. It is such a noble act that anything associated with it also becomes virtuous. The Prophet Muhammad (peace be upon him) said that goodness has been tied to the forelocks of horses until the Day of Judgment. Those who ride horses for jihad receive both spiritual reward and spoils of war."
(Sahih Bukhari 25)
"By the [steeds] that run swiftly, panting,
And striking sparks of fire [with their hooves],
And charging at dawn, Stirring up clouds of dust,
And penetrating into the midst of the enemy ranks—
Indeed, mankind is ungrateful to his Lord."
(Surah Al-'Adiyat, 100:1–6)"

The textbook further undermines contextualisation by adding an authorial statement absent from both the Qur'anic verses and the hadith: "[jihad] is such a noble act that anything associated with it also becomes virtuous." This assertion not only omits historical context but renders it unnecessary, presenting virtue as arising automatically from any association with jihad rather than from its historical, ethical, or religious circumstances. Students are not encouraged to consider the conditions or consequences of armed struggle. Such framing leaves little room for critical engagement with the ethics of violence and risks legitimising even extremist violence if presented as serving the cause of jihad. By emphasising both spiritual

reward and material gain, the passage promotes military action without explaining the circumstances in which it may or may not be considered legitimate.

The significance of jihad in the Iranian curriculum cannot be understood apart from the Iran-Iraq War (1980–1988), commonly known as the "Holy Defence." More than merely a military conflict, it came to symbolise the defence of the Islamic Revolution and the Islamic Republic, transforming the war into a broader religious and national narrative (University of Chicago Library, 2011). This understanding has since become embedded within educational materials, where jihad and martyrdom are frequently presented as religious and national duties (IMPACT-se, 2026). Examining representations of jihad therefore provides insight into whether these themes are presented as subjects for critical examination or as unquestioned imperatives.

A Grade 9 Islamic Education textbook (Āzādī, 2024–25a) illustrates this approach through a section on "Defensive Jihad" bolstered with an emotive account of Iranian special forces sacrificing their lives while crossing the Karun River during the Iran-Iraq War. While the qualifier *defensive* frames jihad as a response to aggression rather than the proactive use of force, the textbook states that, when attacked, "it is obligatory on all Muslims […] to stand up to defend […] with everything they have and drive the enemy out of their land" (p. 137). Without clarifying what "everything they have" entails, the passage leaves open the possibility that defensive jihad is understood primarily in violent terms. Yet Islamic legal traditions also recognise non-violent forms of defensive jihad, including financial support (*al-jihād bi-l-māl*), treating the wounded, and providing logistical assistance (Anzalone, 2016). Apart from an illustration of women tending to an injured soldier, these interpretations are absent, leaving students with a singular understanding of defensive jihad.

Figure 11

Grade 9 Islamic Education and Training Textbook, p. 137.

انواع جهاد

۱ **جهاد دفاعی:** وقتی دشمن به یک کشور اسلامی حمله می‌کند، بر همهٔ مسلمانان ـ مرد و زن، پیر و جوان ـ واجب است با آنچه در توان دارند، به دفاع از کشور اسلامی برخیزند و دشمن را از سرزمین خود بیرون کنند. جنگ‌های احد و احزاب در صدر اسلام، نمونه‌هایی از جهاد دفاعی مسلمانان در آن زمان هستند.

دشمنان می‌دانند دین اسلام همواره باعث بیداری و اتحاد مردم در برابر ظالمان و غارتگران بوده است. از این‌رو، برای اینکه بتوانند ملت‌های دیگر را همیشه اسیر خود نگه دارند، پیش از هر چیز نقشهٔ نابودی اسلام را در سر می‌پرورانند. از این‌رو، هرگونه سستی و کوتاهی در دفاع از میهن اسلامی، گناهی نابخشودنی خواهد بود و عذاب الهی را در پی خواهد داشت.

Translated from Persian: "1 - Defensive Jihad: When an enemy attacks an Islamic country, it is obligatory on all Muslims, male and female, old and young, to stand up to defend the Islamic country with everything they have and drive the enemy out of their land. The Battles of Uhud and the Trench (al-Aḥzāb) at the beginning of Islam are examples of Muslim defensive jihad at that time.

The enemies know that Islam has always awakened and united people against oppressors and raiders. Therefore, in order to be able to keep other nations as their captives, above all else, they have sought to destroy Islam. As such, any weakness and failure to defend the Islamic homeland will be an unforgivable sin and will result in divine punishment."

Figure 12
Grade 9 Islamic Education and Training Textbook, p. 138.

در آن جمع، محمود نوجوانی بود که حتی قبل از اینکه وارد آب شود از شدت سرما می‌لرزید و تا وارد آب می‌شد، عضله‌های پایش می‌گرفت. یک بار در مقابل چشمانم بی‌هوش شد. همهٔ بدنش کرخت شده بود و قدرت حرکت نداشت. به سرعت از آب خارجش کردم. مدتی طول کشید تا حال خود را بازیافت. وقتی متوجه شد که بیرون آب است، شروع کرد به گریه کردن که چرا نمی‌گذارید من هم غواصی را یاد بگیرم تا جزو غواصان خط شکن باشم...[1]

۱ـ برگرفته از کتاب لشکر خوبان، خاطرات مهدی قلی رضایی.

Translated from Persian: "[...] Among them was Mahmoud, a young boy who would begin shivering from the intense cold even before entering the water, and as soon as he entered it, his leg muscles would cramp. Once, right before my eyes, he lost consciousness. His entire body had gone numb, and he was unable to move. I quickly pulled him out of the water. It took him some time to recover. When he realized he was out of the water, he began to cry, saying, 'Why won't you let me learn to dive too, so that I can become one of the assault divers who break through the enemy's front lines?' [...]".

This framing is reinforced through the account of a teenage volunteer becoming an assault diver during the Iran-Iraq War. By combining an unconditional religious obligation ("it is obligatory on all Muslims"), the claim that failing to defend the Islamic homeland constitutes "an unforgivable sin," and a narrative celebrating youthful sacrifice, the textbook presents armed defence as both a moral and religious ideal (p. 138). It further portrays Islam as under constant threat from hostile enemies, later identified as Israel, the United States, and other Western countries, transforming defensive jihad into a politically charged narrative of existential confrontation.

The lesson makes only a limited attempt to contextualise jihad by referring to the early Islamic battles of Uhud and the Trench as examples of defensive jihad. However, these references situate the concept solely within seventh-century Arabia without connecting it to contemporary political, legal, or theological debates. Consequently, the lesson fails to raise awareness of presentism (Huijgen et al.'s principle 1) and reduces complex geopolitical conflicts to a binary struggle between Islam and its enemies. As in the Pakistani curriculum, students are presented with a singular narrative rather than encouraged to engage with competing historical, political, or religious interpretations.

Conclusion

This study has expanded on the premise that the contextualisation of sensitive issues shapes how students understand identity, memory, conflict, religious obligation, and social relations. Drawing on Huijgen et al.'s framework, it has argued that contextualisation extends beyond providing historical background to helping students recognise present-day assumptions (principle 1), situate events within broader contexts (principle 2), explain actions through historical circumstances (principle 3), and engage with multiple perspectives (principle 4). Together, these principles encourage more nuanced understandings by allowing competing interpretations to coexist rather than reducing them to singular or polarised narratives.

The cases of Tunisia, Pakistan, and Iran suggest that the way sensitive issues are contextualised reflects not only how they are explained but also the civic values curricula seek to promote.

Curricula that consistently employ historical inquiry and multiple perspectives are more likely to foster UNESCO's educational values of peace, tolerance, dialogue, respect for diversity, and responsible citizenship. Although contextualisation varies within every curriculum, Tunisia emerges as a strong—though imperfect—example through its emphasis on coexistence, gender equality, non-violence, peaceful conflict resolution, and cultural diversity (Zisenwine & Shalev, 2025). By contrast, the Pakistani (Chakraborty, 2025) and Iranian (Pardo, 2022) curricula more frequently frame sensitive issues through singular ideological narratives centred on religious identity, external threat, and conflict. While both contain isolated messages promoting tolerance, these are often undermined by limited historical and conceptual contextualisation, leaving little room for complexity or alternative interpretations. As a result, they privilege ideological certainty, collective struggle, and militarised understandings of national and religious identity, diverging from UNESCO's vision of education for peace, tolerance, and responsible citizenship.

This study therefore argues that contextualisation is not simply a pedagogical technique but a valuable analytical framework for evaluating how curricula construct and communicate collective narratives. Contextualised teaching encourages historical thinking, empathy, multiperspectivity, and critical analysis, whereas decontextualised presentations risk reinforcing simplistic or ideological understandings of the past. Because collective narratives are often constructed around sensitive issues, the degree of contextualisation should itself be considered an indicator of curricular quality and alignment with international standards for peace and tolerance in education. Future research could extend this framework by examining the relationship between curriculum policy, textbook content, and classroom practice to better understand how educational priorities are translated into the narratives students ultimately encounter.

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

The authors declare that OpenAI ChatGPT was used to assist with word count reduction, language editing, and improving clarity. The authors further declare that, apart from OpenAI ChatGPT, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Abrahamian, E. (2008). *A history of modern Iran.* Cambridge University Press.

Afsaruddin, A. (2013). *Striving in the path of God: Jihad and martyrdom in Islamic thought.* Oxford University Press.

Afary, J. (2009). Introduction. In *Sexual politics in modern Iran* (pp. 1–16). Cambridge University Press.

Ahmed, A. S., & Wadood, A. (2022). *Social studies (Sindh Education Board), Grade 8* (A. M. Sahar & A. Wadood, Trans.). Welcome Book Port.

Al-Qimāṭī, T., Ktitah, Ḥ., Shabshūb, S., Mlika, Sh., & Al-ʻAmūrī, M. (n.d.). *Philosophy (al-Falsafa)*, Humanities Track, Grade 12. National Pedagogical Center.

Al-Shaṭṭī, Ṭ., Al-Maysāwī, M., Ibn Faraḥ, F., Ibn ʻUmar, Ḥ., Al-Muwallahī, Y., Al-Aqadīrī, M., Khayrallāh, Ḥ., ʻAṭiyya, F., & Kaḥlūn, A. (n.d.). *Social Subjects (al-mawādd al-ijtimāʻiyya)*, Grade 6. National Pedagogical Center.

Al-Tlīlī, M. M., Ibn Ṣāliḥ, N. D., Al-Zaghal, R., Al-Ḥāmidī, A. R., Shaybūnī, A., Būʻafīf, N., Al-Ṭarāblūsī, Ṣ., & Ibn Maḥfūẓ, Ṭ. (n.d.). *Social Subjects (al-mawādd al-ijtimāʻiyya)*, Grade 9. National Pedagogical Center.

Anzalone, C. (2016). Women and jihadism: Between the battlefield and the home-front. *Agenda, 30*(3), 18–24.

Āzādī, P., Ikhvān, L., Iʻtiṣāmī M. M., Pīshnamāzī, S. Ṣ, Taqvā, S. M. Ḥ, Dilbarī, S. M., Shokrānī, Y., Kāẓimī, A., Ārānī, M. M. (2024–25a). *Heaven's Messages: Islamic Education and Upbringing (Payāmhā-ye Āsimān: Taʻlīm va-Tarbiyyat-e Islāmī)*, Grade 9. Textbook Printing and Publishing Company.

Āzādī, P., Ibrāhimī, N., Vardī, M. A., Jivārshakiyān, A., Khāliqiyān, F. A., Dilbārī, S. M., Sūznachī, Ḥ., Ṭālibzāda, S. Ḥ., Kāẓimī, A., Fayẓ, M., Laṭīfī, A., Mīrbāqirī, S. M., & Vakīl, M. (2024–25b). *Religion and Life (1) (Dīn va-Zindigī 1).* Textbook Printing and Publishing Company.

Beydoun, K. A. (2008). Laïcité, liberalism, and the headscarf. *Journal of Islamic Law and Culture, 10*(2), 191–215. https://doi.org/10.1080/15288170802285439

Britzman, D. P., & Pitt, A. (2003). Speculations on qualities of difficult knowledge in teaching and learning: An experiment in psychoanalytic research. *International Journal of Qualitative Studies in Education, 16*(6), 755–776. https://doi.org/10.1080/09518390310001632135

Chakraborty, R. (2025). *Review of Pakistani textbooks.* IMPACT-se. https://impact-se.org/wp-content/uploads/2025/12/Pakistan-Report.pdf

Challand, B. (2020). Current legacies of colonial violence and racialization in Tunisia. *Comparative Studies of South Asia, Africa and the Middle East, 40*(2), 248–255. https://doi.org/10.1215/1089201X-8524171

Charrad, M. M. (2001). *States and women's rights: The making of postcolonial Tunisia, Algeria, and Morocco.* University of California Press.

Cooper, H., & Nichol, J. (Eds.). (2015). *Identity, trauma, sensitive and controversial issues in the teaching of history.* Cambridge Scholars Publishing.

Dearden, R. F. (1981). Controversial issues and the curriculum. *Journal of Curriculum Studies, 13*(1), 37–44. https://doi.org/10.1080/0022027810130105

Elmersjö, H. Å., & Persson, A. (2023). Controversial issues and the nature of history: Teachers' views on controversial historical issues in Swedish lower secondary school. *History Education Research Journal, 20*(1), Article 8. https://doi.org/10.14324/HERJ.20.1.08

Encyclopaedia Britannica. (2008, June 27). Husaynid dynasty. In *Encyclopaedia Britannica.* https://www.britannica.com/topic/Husaynid-dynasty

Enterprise Portuaire de Skikda. (n.d.). *Enterprise Portuaire de Skikda.* https://skikda-port.com/

Esposito, J. L. (2002). *Unholy war: Terror in the name of Islam.* Oxford University Press.

Fair, C. C. (2007). Militant recruitment in Pakistan: A new look at the militancy–madrasah connection. *Asia Policy, 4*(1)*,* 107–134. https://dx.doi.org/10.1353/asp.2007.0006

Firestone, R. (1999). *Jihād: The origin of holy war in Islam.* Oxford University Press.

France. (2004). *Loi n° 2004-228 du 15 mars 2004 encadrant, en application du principe de laïcité, le port de signes ou de tenues manifestant une appartenance religieuse dans les écoles, collèges et lycées publics* [Law No. 2004-228 of March 15, 2004, regulating, pursuant to the principle of laïcité (state secularism), the wearing of signs or clothing manifesting religious affiliation in public schools]. https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000000417977

France. (2010). *Loi n° 2010-1192 du 11 octobre 2010 interdisant la dissimulation du visage dans l'espace public* [Law No. 2010-1192 of October 11, 2010, prohibiting the concealment of the face in public spaces]. https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000022911670

Haqqani, H. (2005). *Pakistan: Between mosque and military.* Carnegie Endowment for International Peace.

Hidalgo Castillo, D., & Ducruet, C. (2017). Northwest Africa from colonial to global shipping. In C. Ducruet (Ed.), *Advances in shipping data analysis and modeling: Tracking and mapping maritime flows in the age of big data* (pp. 397–413). Routledge.

Huijgen, T., Van de Grift, W., Van Boxtel, C., & Holthuis, P. (2018). Promoting historical contextualization: The development and testing of a pedagogy. *Journal of Curriculum Studies, 50*(3), 410–434. https://doi.org/10.1080/00220272.2018.1435724

IMPACT-se. (2026, April). *From classroom to conflict: Iranian textbooks and the ideological roots of the US-Iran-Israel war.* https://www.impact-se.org/wp-content/uploads/Iran-Spotlight-April2026.pdf

Intiẓārī, A., et al. (2024–25). *Sociology (1) (Jāmi'e-shināsī 1)*, Grade 10. Textbook Printing and Publishing Company.

Jalal, A. (2008). *Partisans of Allah: Jihad in South Asia.* Harvard University Press.

Lyasīr, Fatḥī, et al. (n.d.). *History (al-Tārīkh)*, Scientific Track, Grade 12. National Pedagogical Center.

Malik, M. R., & Khuda Bakhsh, R. (2022). *Qur'an Translation [Tarjumat al-Qur'ān] (Punjab Education Board)*, Grade 7. Punjab Curriculum and Textbook Board.

Maravall, L. (2019). The impact of a "colonizing river": Colonial railways and the indigenous population in French Algeria at the turn of the century. *Economic History of Developing Regions, 34*(1), 16–47.

Maskiell, M. (1985). Social change and social control: College-educated Punjabi women, 1913–1960. *Modern Asian Studies, 19*(1), 55–83. https://www.jstor.org/stable/312321

Moradi, L., Whitmore, D. K., & Bose, N. (2024). Colonial legacies and their impact on South Asian political institutions. *Pakistan Journal of History and Civilization, 1*(1), 3298–3306.

Pardo, E. J. (2022, August). *Iran's radical education: An interim update report, 2021–22*. IMPACT-se. https://www.impact-se.org/wp-content/uploads/Irans-Radical-Education-7.pdf

Perkins, K. (2014). *A history of modern Tunisia* (2nd ed.). Cambridge University Press.

Saleem, N., & Rizvi, F. (2011). The lingering impact of colonization on Pakistan: Negative or positive? *South Asian Studies, 26*(2), 401–410.

Tunçer, A. C. (2021). Foreign debt and colonization in Egypt and Tunisia (1862–82). In P. Penet & J. F. Zendejas (Eds.), *Sovereign debt diplomacies: Rethinking sovereign debt from colonial empires to hegemony* (pp. 73–93). Oxford University Press.

United Nations Educational, Scientific and Cultural Organization. (2014). *Textbooks and learning resources: Guidelines for developers and users.* https://unesdoc.unesco.org/ark:/48223/pf0000226135_eng

United Nations Educational, Scientific and Cultural Organization. (2017). *Unmasking racism: Guidelines for educational materials.* https://unesdoc.unesco.org/ark:/48223/pf0000232222

University of Chicago Library. (n.d.). *The Holy Defense*. In *The Graphics of Revolution and War: Iranian Poster Arts.* https://www.lib.uchicago.edu/collex/exhibits/graphics-revolution-and-war-iranian-poster-arts/holy-defense/

Zisenwine, D., & Shalev, I. (2025, December). *2025 Tunisian curriculum: Between progress and prejudice*. IMPACT-se. https://impact-se.org/wp-content/uploads/2026/06/Tunisia-Report-2025-final-1.pdf

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Validation of a Multiple-Choice Physics Test Using Classical Test Theory: Toward a More Up-to-Date International Item Database

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Abstract

This study examines the psychometric properties of a multiple-choice physics questionnaire using the framework of Classical Test Theory (CTT), with the aim of validating individual items and contributing to the development of a reliable item bank for research and assessment. The instrument was designed to investigate students' conceptual understanding of fundamental physics topics and to identify common misconceptions or conceptual errors that may persist after formal instruction. The questionnaire is being developed within the T.I.M.E. project by Politecnico di Milano in collaboration with Doshisha University, Bauman Moscow State Technical University, and the University of Trento. The dataset includes responses from approximately 1,000 university students enrolled in engineering and science programs. This internationally diverse sample includes students from Italian, Japanese, and Russian institutions, enabling the analysis of response patterns across different educational contexts and exploring how prior schooling systems influence the persistence of physics misconceptions. Item analysis was conducted using standard CTT indicators, including item difficulty, discrimination indices, and distractor functioning. Particular attention was devoted to distractor performance to identify functional alternatives that capture specific incorrect reasoning patterns. Results indicate that ten of the twelve analyzed items include effective distractors and are well-constructed, while two items exhibit weak distractors that may require revision. These results represent a first step toward the construction of an updated international physics item bank, which could support both formative and summative assessment and enable comparative studies of physics learning across different educational systems.

Keywords: misconceptions, distractor, test, stem, physics

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Introduction

Multiple-Choice Questions (MCQs) are among the most popular evaluation tools in education and psychometrics. Their widespread adoption across standardized assessments and academic contexts is primarily driven by their structural efficiency, which allows for the objective, fair, and replicable scoring of large student cohorts in reduced timeframes, while ensuring an extensive coverage of curriculum topics within a single testing session (*Effective Assessment and the Improvement of Education*, 2017; Popham, 2020). However, the utility of MCQs extends far beyond mere administrative convenience or the assessment of low-level rote learning. When built with proper scientific rigor, they do much more than just test factual memory (Haladyna, 2004): they can effectively measure higher-order cognitive skills—such as critical thinking, analytical reasoning, and the application of conceptual knowledge to novel scenarios—and help diagnose deep-seated student misconceptions (Haladyna et al., 2002). By meticulously embedding specific incorrect reasoning patterns into functional alternative options, well-designed MCQs transform a summative grading tool into a powerful diagnostic instrument capable of mapping the intricate and flawed mental models that students often harbor after formal instruction (Bozzi et al., 2020).

A standard multiple-choice question relies on a clear three-part structure: a stem (the question or problem statement), a key (the single correct and scientifically sound answer), and the distractors (the incorrect options). However, writing these options is far from a mechanical task; as Haladyna (2004) wrote, *"item writing is an art form that is informed by science."* While statistical analysis evaluates a test *after* it has been taken, initially designing a question that truly taps into a student's thinking requires a mix of pedagogical intuition and deep subject expertise (Haladyna et al., 2002).

Nevertheless, to turn a collection of questions into a truly reliable research instrument, ex-post statistical validation is essential. Using frameworks like Classical Test Theory (CTT) (Crocker & Algina , 2006) or Item Response Theory (IRT) (Lord, 1980), researchers evaluate the quality of MCQs through specific psychometric parameters. These include the difficulty index (p), which represents the proportion of students who answered the item correctly. Monitoring this index is crucial, as it helps researchers maintain an overall balance in the test's difficulty. Additionally, the evaluation relies on the discrimination index, with the point-biserial correlation serving as a primary indicator. This parameter measures how effectively a question differentiates between high-performing students and those who struggle with the material.

Finally, distractor analysis looks at how incorrect answers are distributed across different performance groups (Haladyna & Downing, 1993). This last parameter is particularly crucial. Analyzing distractors does not just prove that the alternative options are plausible and clear; it fundamentally allows us to track and identify persistent misconceptions within the student sample. Indeed, in well-crafted tests, distractors are never chosen at random; instead, they are designed around common reasoning errors and flawed mental models, making them invaluable for diagnostic analysis and for mapping student misconceptions (Bozzi et al., 2020).

This study focuses specifically on the distractor analysis of a physics questionnaire developed by Politecnico di Milano within the T.I.M.E. (*Top International Managers in Engineering*) project, a collaborative effort with the Bauman Moscow State Technical University (Russia), Doshisha University (Japan) and the University of Trento.

Research Questions

RQa: How can a distractor efficiency analysis guide the specific revision and optimization of the test items?

RQb: What distinct response patterns emerge when evaluating these items across different student nationalities?

Theoretical Framework and Item-Level Analysis

This research is situated within the framework of Classical Test Theory (CTT). Within this paradigm, psychometric evaluation involves both item-level parameters, which assess the performance of individual tasks, and global parameters, which evaluate the instrument as a whole.

At the individual item level, a primary metric evaluated is the Item Difficulty Index (p), defined as in Equation 1.

$$p = \frac{N_1}{N} \tag{1}$$

Where N_1 represents the number of correct responses and N denotes the total sample size. Under this formulation, lower values of p indicate greater item difficulty. Based on their empirical values of difficulty index, items are stratified into distinct operational categories, ranging from difficult and moderately difficult to medium (optimal) and moderately easy.

To evaluate the capacity of an item to distinguish between high-performing and low-performing examinees, the Item Discrimination Index (D) is computed. The sample is first ranked by total score and partitioned into four equal-sized groups representing score quartiles. Equation 2 expresses the mathematical formulation of the D index.

$$D = \frac{N_H - N_L}{n} \tag{2}$$

Where N_H and N_L represent the number of correct responses within the highest and lowest scoring quartiles, respectively, and n is the total number of respondents within a single quartile.

Because identical total scores (ties) can lead to arbitrary student placement at the boundaries of the quartiles, the initial random ordering of the dataset could artificially skew the resulting discrimination index. To mitigate this potential bias, an iterative resampling procedure was implemented. Specifically, the dataset was subjected to 100,000 random re-orderings (shuffling) within identical score strata prior to quartile assignment, and the discrimination index was subsequently recalculated for each iteration. The final classification of the items, following the standard psychometric thresholds established by Crocker and Algina (Crocker & Algina, 2006), was ultimately determined using the mean discrimination value obtained across these iterations.

An additional robust metric employed to evaluate item discrimination and option efficiency is the Point-Biserial Correlation Coefficient (r_{pb}). In the context of distractor analysis, this

coefficient measures the correlation between a student's choice of a specific response option (correct or incorrect) and their overall score on the assessment. It is defined by Equation 3.

$$r_{pb} = \frac{\bar{X}_1 - \bar{X}_0}{\sigma_x}\sqrt{p(1-p)} \tag{3}$$

Where $\bar{X}_1$ represents the mean total score of examinees who selected the specific option, $\bar{X}_0$ is the mean total score of examinees who did not select that option, σ_x is the standard deviation of the total test scores, and p is the difficulty index of the item.

The diagnostic value of the point-biserial coefficient varies depending on whether the analyzed option is the correct answer (the key) or an incorrect alternative (a distractor). For the correct key, a coefficient of $r_{pb} \geq 0.20$ is considered indicative of an acceptable-to-strong positive correlation, confirming that higher-performing students are successfully selecting the correct answer. Conversely, for functional distractors, an ideal coefficient falls within the negative range of $-0.20 \leq r_{pb} < 0$, demonstrating that the option successfully draws lower-performing students away from the key (Attali & Fraenkel, 2000).

Furthermore, a strongly negative coefficient where $r_{pb} < -0.20$ highlights a highly effective distractor that likely aligns with a prevalent student misconception or a systematic conceptual error (Aslanides & Savage, 2013). On the other hand, if a distractor yields a positive correlation where $r_{pb} > 0$, it implies that high-performing students are preferentially selecting this incorrect option. This statistical anomaly strongly suggests that the item phrasing is ambiguous or flawed, thereby signaling the need for immediate qualitative revision.

To evaluate the overall reliability and internal consistency of the assessment instrument, the Kuder-Richardson Formula 20 (KR-20) was computed. Since the items are scored dichotomously as correct or incorrect, the KR-20 index serves as a robust measure to determine the degree to which all tasks within the questionnaire consistently measure the same underlying conceptual construct. The formula is expressed by Equation 4.

$$KR\text{-}20 = \frac{K}{K-1}\left(1 - \frac{\sum_{i=1}^{K} p_i(1-p_i)}{\sigma_X^2}\right) \tag{4}$$

Within this formulation, the parameters are defined as follows: K represents the total number of items comprising the instrument, p_i denotes the Item Difficulty Index of the i-th item, and σ_X^2 signifies the variance of the observed total test scores. In line with psychometric literature, values equal to or greater than 0.70 are considered acceptable for low-stakes diagnostic research tools, while values equal to or exceeding 0.80 indicate high internal consistency, ensuring that the observed test scores are stable and largely unaffected by measurement error (Bland & Altman, 1997).

While item-level discrimination parameters evaluate individual tasks, Ferguson's Delta (δ) is employed as a global psychometric index to assess the comprehensive discriminatory power of the entire assessment instrument. Specifically, it measures the degree to which the test can successfully differentiate among examinees across the full spectrum of abilities, maximizing the variance of the total score distribution. Ferguson's Delta is formulated Equation 5:

$$\delta = \frac{N^2 - \sum f_i^2}{N^2 - \frac{N^2}{K+1}} \tag{5}$$

Where N denotes the total sample size, K represents the total number of items in the test, and f_i is the frequency of examinees obtaining each possible total score from $i = 0$ to K.

The value of δ ranges from 0 to 1, where a value of 1.0 indicates an ideal, uniform distribution in which every possible test score is achieved by an equal number of respondents, thereby providing maximum discrimination. In accordance with psychometric standards established in educational measurement, a test is considered to possess a highly satisfactory discriminatory capacity if $\delta \geq 0.90$. A high Ferguson's Delta ensures that the instrument does not merely group students into broad performance categories but rather offers a fine-grained differentiation of their conceptual understanding.

Option Response Curves (ORCs)—frequently designated as *Distractor Response Curves*—constitute a non-parametric, graphical diagnostic tool designed to evaluate the performance of multiple-choice items. Unlike standard CTT indices, which condense distractor performance into a single, static correlation coefficient, ORCs model the empirical probability of selecting each individual response option—both the correct key and the incorrect distractors—as a continuous function of the examinee's overall proficiency. By analyzing the full spectrum of options simultaneously, ORCs provide a fine-grained, visual assessment of how effectively each alternative attracts or repels students across different ability levels.

In an ORC plot, the data are mapped across two principal axes. The horizontal axis, or abscissa, represents the examinees' proficiency level. Within a CTT framework, this is typically operationalized by partitioning the sample into ordered performance intervals based on their raw total test score, such as deciles. The vertical axis, or ordinate, denotes the conditional probability from 0 to 1, or the relative frequency of examinees within a given ability stratum who selected that specific option. Each response alternative yields its own distinct trajectory, which is expected to align with specific psychometric profiles.

The geometric behavior of an ORC allows researchers to evaluate the structural integrity of a physics item and uncover underlying cognitive patterns through distinct curve typologies (Morris et al., 2012).

The curve for the correct key must be monotonically increasing, a profile that confirms that as a student's conceptual understanding and overall test performance increase, the probability of selecting the correct option approaches unity. Conversely, functional distractors exhibit an ideal incorrect profile characterized by a monotonically decreasing trend. These alternatives should possess high attractivity for low-performing students to capture random guessing or superficial reasoning and systematically drop to zero as student proficiency increases.

Beyond these monotonic trends, non-monotonic curves provide critical value for misconception identification. A distractor that yields a bell-shaped curve peak within the intermediate ability ranges. This specific profile is highly valuable for Physics Education Research (PER) because it visually captures a transitional cognitive state where students have moved past random guessing but are strongly drawn to a structured, systematic misconception before achieving full scientific mastery.

Finally, ORCs are instrumental in identifying flawed or ambiguous items. If a distractor curve trends upward or remains stable within the high-ability strata, it indicates a critical item anomaly. A positive slope for an incorrect option suggests that top-performing students are preferentially selecting it, signaling that the option may be scientifically ambiguous, poorly phrased, or double-keyed, thereby necessitating immediate qualitative revision.

Methodology

Research Design

The diagnostic test was developed through a collaborative effort between the Politecnico di Milano and the University of Trento. This questionnaire comprises 12 multiple-choice items, systematically categorized into three macro-domains of physics: Mechanics, Thermodynamics, and Electromagnetism (Bozzi et al., 2019). Each item features a single correct response (the key) and three incorrect alternatives (distractors). Crucially, the distractors were deliberately engineered based on physics education literature to isolate and identify specific student misconceptions or systematic conceptual errors, as delineated in Table 1. No penalties or negative markings were applied for incorrect answers; consequently, the observed total test scores are distributed within a range of 0 to 12. To facilitate the tracking of items across the different conceptual areas of the test, a standard coding system was adopted: items focusing on Mechanics are labeled as IM, those on Thermodynamics as IT, and those covering Electromagnetism as IE.

Table 1

Classification of Test Items and Mapping of the Investigated Misconception

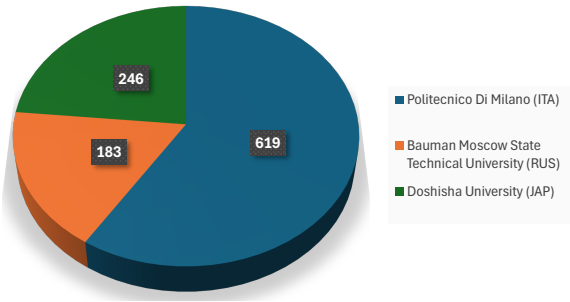
Quiz	Misconception area	Specific heading	Macro-area
IM1	Displacement and distance travelled	Kinematics	Mechanics
IM2	Static friction	Force	Mechanics
IM3	Impulse, momentum law	Linear momentum	Mechanics
IM4	Conservation of energy, linear and angular momentum	Gravitation	Mechanics
IT1	Phase transition and heat exchanged	Thermodynamics processes	Thermodynamics
IT2	Relation between heat and energy of a Thermodynamicssystem	Heat	Thermodynamics
IT3	Quasi-static and no quasi-static adiabatic process	Thermodynamics processes	Thermodynamics
IT4	Efficiency of a heat engine and comparison with Carnot engine	Heat engine	Thermodynamics
IE1	Source of an electric field	Electric field	Electromagnetism
IE2	Electrical induction	Conductors	Electromagnetism
IE3	Electric field in the presence of a dielectric	Dielectrics	Electromagnetism
IE4	Equilibrium of a current loop lying in a magnetic field	Magnetostatics	Electromagnetism

Participants and Procedure

The initial international administration of the survey targeted undergraduate students across three distinct institutions: the Politecnico di Milano (Italy), the Bauman Moscow State Technical University (Russia), and Doshisha University (Japan) divided as shown in Figure 1. To ensure the internal validity of the study and isolate the target population, a strict filtering criterion was applied to include exclusively first-year undergraduate students (*freshmen*). Following this sample reduction procedure, the final validated dataset comprised a total sample size of $N = 1048$ students. The test items were originally drafted in English to establish a baseline conceptual framework. To ensure linguistic equivalence and cross-cultural validity

across the cohorts, the questionnaire was subsequently translated into the respective native languages of the participating universities. All psychometric analyses, statistical computations, and data visualizations were executed using the R statistical computing environment (RStudio).

Figure 1
Distribution of the Sample by Nationality



Results

As a first step, the classical CTT parameters were calculated. The item difficulty index was computed for the overall sample and for each national subgroup (*Table 2*), while the discrimination index (*Table 3*) and the point-biserial correlation coefficient (*Table 4*) were calculated for the overall sample. As shown in Table 3, D_{min} and D_{max} denote the minimum and maximum values of the discrimination index D observed over the entire set of permutations.

Table 2
Calculated Item Difficulty Index for Each Item and Nationality

Item	ALL	ITA	JAP	RUS
IM1	0.31	0.14	0.46	0.70
IM2	0.25	0.24	0.24	0.32
IM3	0.36	0.34	0.38	0.41
IM4	0.18	0.13	0.29	0.20
IT1	0.63	0.60	0.62	0.77
IT2	0.51	0.58	0.42	0.37
IT3	0.18	0.18	0.20	0.17
IT4	0.48	0.54	0.42	0.37
IE1	0.41	0.44	0.31	0.44
IE2	0.12	0.10	0.15	0.14
IE3	0.45	0.50	0.31	0.48
IE4	0.16	0.11	0.19	0.30

Table 3
Mean Item Discrimination Index Obtained From 100,000 Permutations

Items	Dmean	Dmin	Dmax	Classification
IM1	0.36	0.28	0.42	Reasonably good item (RG)
IM2	0.28	0.22	0.35	Marginal item (M)
IM3	0.37	0.30	0.44	Reasonably good item (RG)
IM4	0.19	0.13	0.25	Poor item (P)
IT1	0.42	0.35	0.50	Good Item (G)
IT2	0.41	0.34	0.50	Good Item (G)
IT3	0.18	0.13	0.24	Poor item (P)
IT4	0.35	0.28	0.43	Reasonably good item (RG)
IE1	0.44	0.38	0.51	Good Item (G)
IE2	0.18	0.13	0.23	Poor item (P)
IE3	0.43	0.35	0.50	Good Item (G)
IE4	0.19	0.13	0.24	Poor item (P)

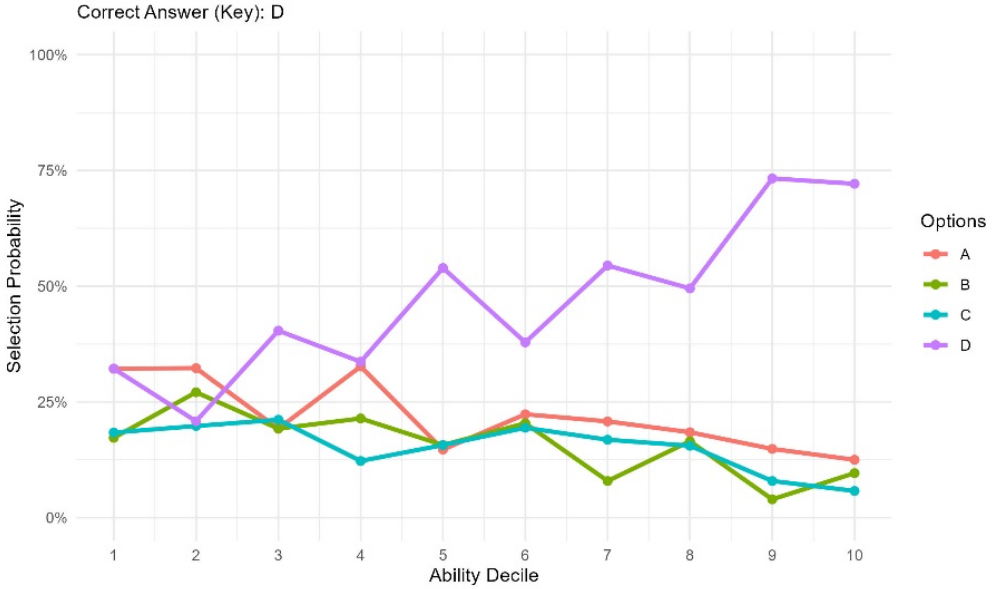
Table 4
RPBI Values and Response Option Selection Percentages for Each Item

Item	Option	Type	rpbi_option	%		Item	Option	Type	rpbi_option	%
IE1	A	Distractor	-0.14	15.5		IM3	A	Distractor	-0.23	40.6
IE1	B	Distractor	-0.13	19.0		IM3	B	Key	0.35	36.0
IE1	C	Key	0.37	40.9		IM3	C	Distractor	-0.05	11.3
IE1	D	Distractor	-0.13	21.6		IM3	D	Distractor	-0.05	9.4
IE2	A	Distractor	-0.06	26.0		IM4	A	Key	0.22	17.7
IE2	B	Distractor	-0.02	37.3		IM4	B	Distractor	-0.07	38.5
IE2	C	Distractor	-0.06	22.2		IM4	C	Distractor	-0.15	18.0
IE2	D	Key	0.25	12.1		IM4	D	Distractor	0.06	23.3
IE3	A	Distractor	-0.11	20.7		IT1	A	Distractor	-0.07	2.7
IE3	B	Distractor	-0.11	15.1		IT1	B	Distractor	-0.15	9.6
IE3	C	Distractor	-0.08	14.5		IT1	C	Key	0.38	63.5
IE3	D	Key	0.30	45.0		IT1	D	Distractor	-0.23	21.9
IE4	A	Distractor	-0.03	29.7		IT2	A	Distractor	-0.24	24.3
IE4	B	Key	0.21	16.1		IT2	B	Key	0.35	50.7
IE4	C	Distractor	0.00	16.5		IT2	C	Distractor	-0.11	19.8
IE4	D	Distractor	-0.09	34.9		IT2	D	Distractor	-0.06	3.7
IM1	A	Distractor	-0.16	44.8		IT3	A	Key	0.21	18.2
IM1	B	Key	0.34	31.4		IT3	B	Distractor	-0.07	21.0
IM1	C	Distractor	-0.07	8.3		IT3	C	Distractor	-0.02	18.9
IM1	D	Distractor	-0.12	13.1		IT3	D	Distractor	-0.02	36.1
IM2	A	Distractor	-0.10	24.6		IT4	A	Distractor	-0.12	23.5
IM2	B	Distractor	-0.03	35.1		IT4	B	Distractor	-0.11	17.5
IM2	C	Distractor	-0.13	12.5		IT4	C	Key	0.29	48.4
IM2	D	Key	0.28	25.4		IT4	D	Distractor	-0.07	6.1

Option Response Curves (ORCs) were generated for all items. Figure 2 presents a representative example of an ORC. Regarding this particular item. option D was the keyed response. whereas the other choices functioned as distractors.

Figure 2

Option Response Curves for Electromagnetism Item IE3



Finally, the KR-20 coefficient and Ferguson's delta were calculated for the overall sample. yielding values of 0.10 and 0.90. respectively.

Discussion

The findings of this study offer valuable insights into both the psychometric quality of the instrument and the cultural factors influencing physics education. The overall distribution of the item difficulty index reveals a balanced assessment tool. consisting of four medium-high difficulty items. six medium difficulty items. and two low-difficulty items (*Figure 3*).

Shifting the focus to the second research question (RQb). the analysis of cross-national response patterns reveals distinct variations when the items are disaggregated by nationality. The most prominent cross-national divergence is observable in the Item Difficulty Indices (*Figure 4*). Specifically. mechanics items such as IM1 and IM2 were found to be substantially less difficult for the Russian student cohort compared to their Italian and Japanese peers. Conversely. the Italian cohort demonstrated greater proficiency in specific thermodynamics items like IT2 and IT4. These localized fluctuations in item difficulty underscore that student vulnerability to specific physical misconceptions is not universally uniform. Instead. it is modulated by national curricula and instructional methodologies. making cross-cultural validation a requirement for the creation of a standardized international item bank.

Figure 3
Difficulty Level

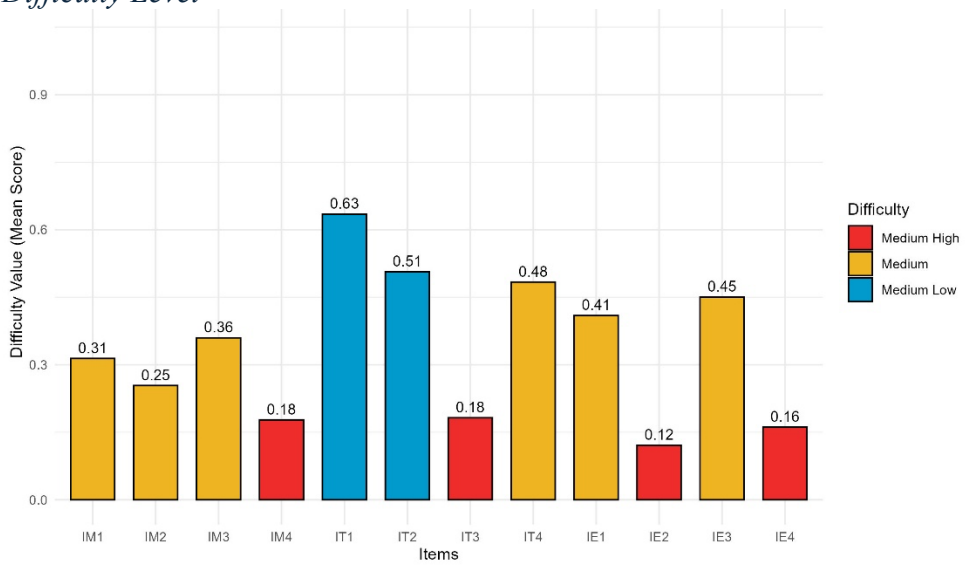
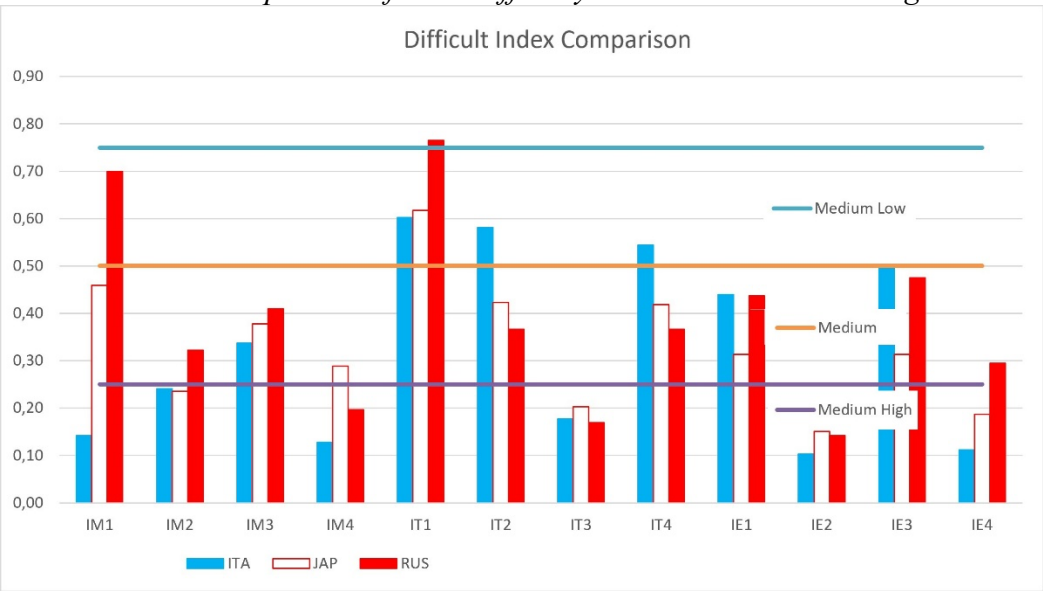


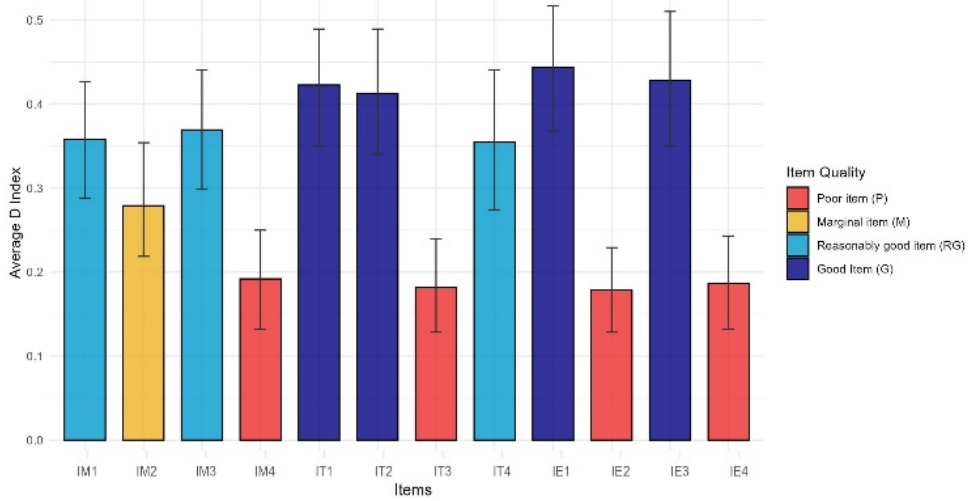
Figure 4
Cross-National Comparison of Item Difficulty Index Across the Investigated Countries



As illustrated in Figure 5. the overall discrimination index demonstrates a well-balanced profile. featuring four items with strong discriminatory power and three items that discriminate reasonably well (Ebel & Frisbie, 1991). The bars represent the Discrimination Index range as generated during the permutation cycles.

Figure 5

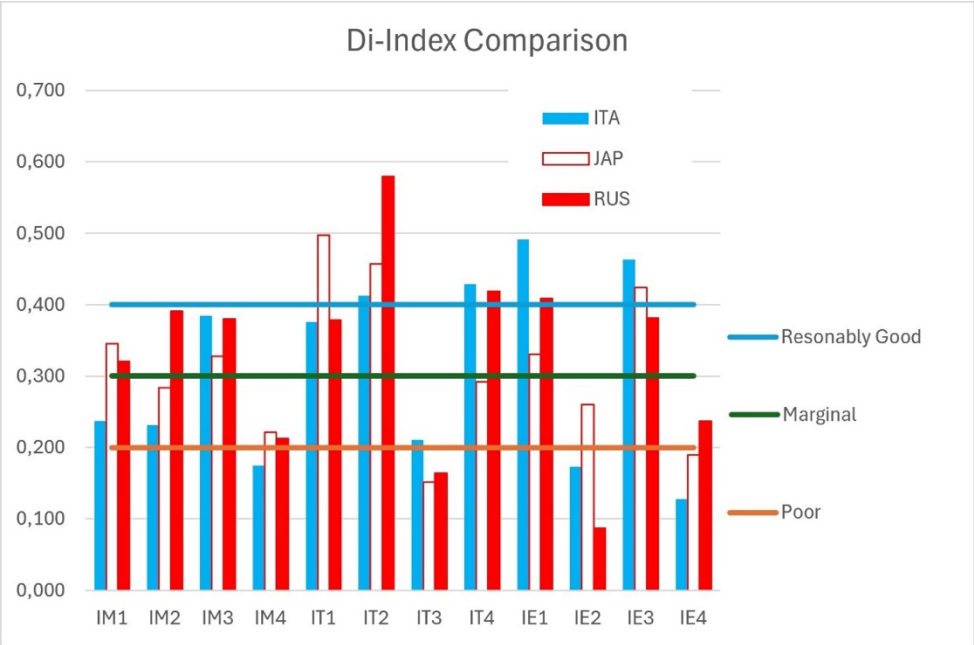
Overall Means Discrimination Index Across All Nationalities (100.000 Permutations)



A similar cross-national variation is observable in the discrimination index. as shown in Figure 6. although the differences among the participating nationalities are less pronounced than those found in the item difficulty indices.

Figure 6

Cross-National Comparison of Discrimination Index Across the Investigated Countries

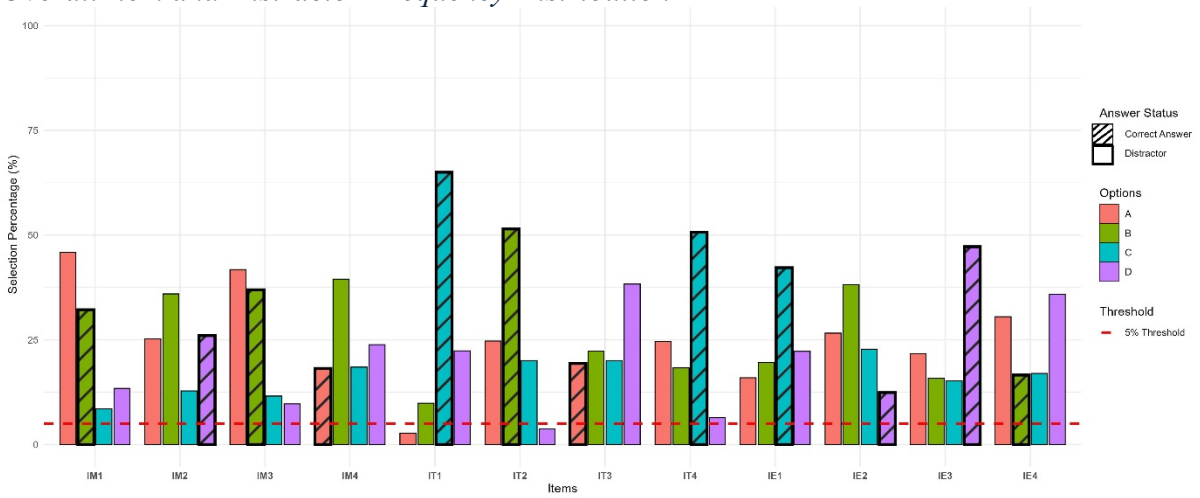


Regarding the global reliability indices. the KR-20 coefficient was found to be particularly low (0.10). well below the commonly accepted threshold of 0.70. The low KR-20 coefficient observed globally does not necessarily imply poor item quality; rather. as demonstrated by Cortina (1993). internal consistency estimates are strictly dependent on the unidimensionality assumption and significantly underestimate reliability when an instrument taps into multiple distinct dimensions. In the present study. this result is an expected statistical consequence of the highly heterogeneous and multidimensional content covered by the inventory. The instrument was deliberately designed as a diagnostic inventory aimed at identifying students' misconceptions rather than as a traditional unidimensional summative assessment.

Regarding the first research question (RQa). the distractor efficiency analysis provides an empirical roadmap for targeted qualitative item optimization. By utilizing frequency thresholds. it was possible to successfully isolate specific items requiring immediate structural refinement. For instance. items IT1 and IT2. as shown in Figure 7. were found to contain non-functional distractors. with alternative choices selected by fewer than 5% of the examinees. This signals that these distractors fail to act as plausible options and should be replaced to maximize overall option efficiency.

Figure 7

Overall Item and Distractor Frequency Distribution



An analysis of the point-biserial correlation coefficients (r_{pbi}) in Table 5—derived by condensing Table 4—reveals several noteworthy dynamics. Specifically. items IM3. IT1. and IT2 display options with strongly negative correlations. serving as indicators of specific student misconceptions (Bozzi et al., 2020). Regarding item IM4. a positive coefficient is observed for a distractor. which may reflect structural ambiguity in its wording. Similarly. item IE4 presents an interesting case with a correlation coefficient of zero; this lack of correlation not only places the option on the critical threshold for reclassification but may also point to ambiguous phrasing. It should be noted that these statistical findings do not deterministically mandate revisions but rather highlight the value of a qualitative peer review of the items.

Table 5

RPBI Values and Response Option Selection Percentages

Item	Option	rpbi_option	Type	%	Classification
IT2	A	-0.24	Distractor	24.3	Strong Misconception
IT1	D	-0.23	Distractor	21.9	Strong Misconception
IM3	A	-0.23	Distractor	40.6	Strong Misconception
IE4	C	0.00	Distractor	16.5	Functional Distractor
IM4	D	0.06	Distractor	23.3	Ambiguous/ Atypical

Examining the Option Response Curves (ORCs) for these items provides further insight. For instance. Figure 8 shows that option A of Item IT2 attracts a remarkably high number of students from the low- and mid-ability brackets. suggesting a strong underlying misconception. Furthermore. distractor D is selected by an insufficient number of students. rendering it non-functional. Conversely. Figure 9 reveals that distractor D of item IM4 tends to attract a greater proportion of students from the high and upper-middle ability levels than from lower tiers. Consistent with the positive correlation noted earlier. this unexpected pattern points to potential ambiguity in the wording. signaling that the option should be reviewed for potential revision.

Figure 8

Option Response Curve. Item IT2

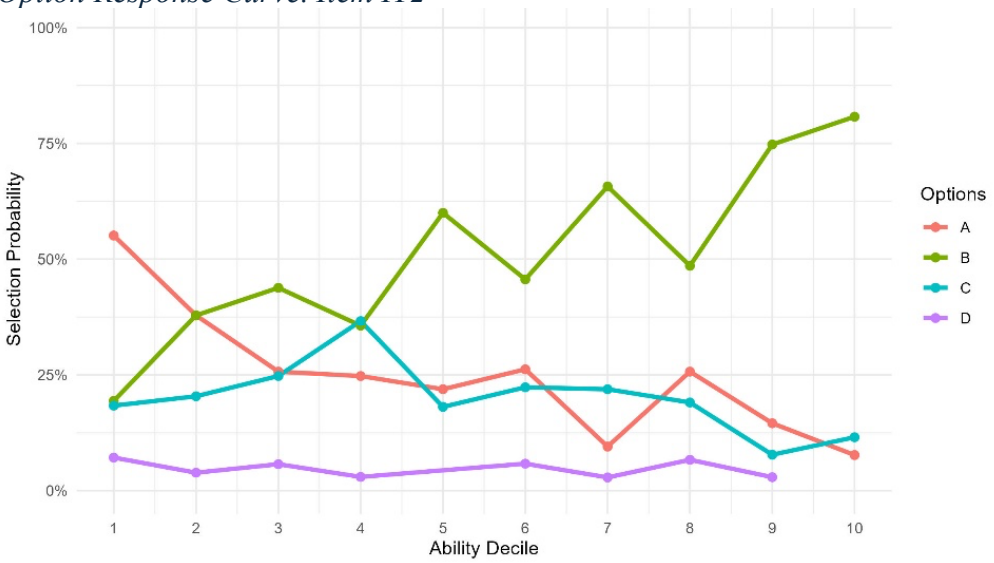
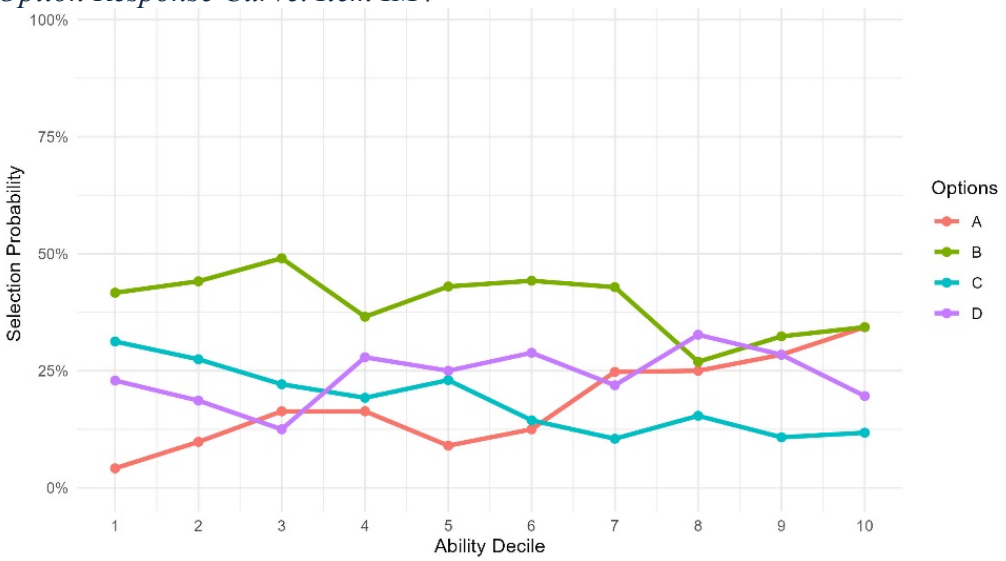


Figure 9

Option Response Curve. Item IM4



Conclusion

This study investigated the optimization and potential integration of the Politecnico-developed physics test with established international standards. specifically the Force Concept Inventory (FCI). to construct a robust evaluative assessment tool.

Through a systematic distractor efficiency analysis (RQa). we identified specific items—such as IT1 and IT2—with low-performing options falling below the critical 5% selection threshold. as well as items showing anomalous point-biserial correlations (r_{pbi}) or unexpected Option Response Curves (ORCs). like IM2. IM4. and IE4. Rather than mandating immediate. arbitrary changes. these psychometric indicators provided an empirical roadmap for a targeted qualitative peer review. isolating instances of structural text ambiguity and deep-seated student misconceptions.

Furthermore. cross-examining these items across international cohorts (RQb) revealed distinct. nationality-specific response patterns. These variations underscore the critical importance of cross-cultural validation when designing a standardized diagnostics item bank.

Ultimately. refining the non-functional distractors and mapping these cross-national differences aims not only to improve the internal validity of the Politecnico test. but also seeks to establish a more calibrated framework. When paired with the FCI. this optimized instrument may provide a comprehensive tool with the potential to yield deep. rigorous evaluative insights into university-level physics education across diverse instructional contexts.

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

The author declares that Grammarly. an AI-assisted writing software. was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that. apart from Grammarly. no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas. design. procedures. findings. analyses. and discussion are originally written and derived from careful and systematic conduct of the research.

References

Aslanides, J. S., & Savage, C. M. (2013). Relativity concept inventory: Development. analysis. and results. *Physical Review Special Topics - Physics Education Research, 9*(1), 010118. https://doi.org/10.1103/PhysRevSTPER.9.010118

Attali, Y., & Fraenkel, T. (2000). The Point-Biserial as a Discrimination Index for Distractors in Multiple-Choice Items: Deficiencies in Usage and an Alternative. *Journal of Educational Measurement, 37*(1), 77–86. https://doi.org/10.1111/j.1745-3984.2000.tb01077.x

Bland, J. M., & Altman, D. G. (1997). Statistics notes: Cronbach's alpha: Table 1. *BMJ, 314*(7080), 572. https://doi.org/10.1136/bmj.314.7080.572

Bozzi, M., Ghislandi, P., Tsukagoshi, K., Matsukawa, M., Wada, M., Nagaoka, N., Pnev, A. B., Zhirnov, A. A., Guillerme, G., & Zani, M. (2019). Highlight misconceptions in Physics: A TIME project. *INTED2019 Proceedings,* 2520–2525. https://library.iated.org/view/BOZZI2019HIG

Bozzi, M., Ghislandi, P., & Zani, M. (2020). Misconceptions in Physics: An uphill climb. *INTED2020 Proceedings,* 2162–2170. https://library.iated.org/view/BOZZI2020MIS

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*(1), 98–104. https://doi.org/10.1037/0021-9010.78.1.98

Crocker, L., & Algina, J. (2006). *Introduction to classical and modern test theory*.

Ebel, R. L., & Frisbie, D. A. (1991). *Essentials of educational measurement* (5th ed). Prentice Hall.

Haladyna, T. M. (Ed.). (2004). *Developing and validating multiple-choice test items* (3rd ed). Lawrence Erlbaum Associates.

Haladyna, T. M., & Downing, S. M. (1993). How Many Options is Enough for a Multiple-Choice Test Item? *Educational and Psychological Measurement, 53*(4), 999–1010. https://doi.org/10.1177/0013164493053004013

Haladyna, T. M., Downing, S. M., & Rodriguez, M. C. (2002). A Review of Multiple-Choice Item-Writing Guidelines for Classroom Assessment. *Applied Measurement in Education, 15*(3), 309–333. https://doi.org/10.1207/S15324818AME1503_5

Lord, F. M. (1980). *Applications of item response theory to practical testing problems*. L. Erlbaum Associates.

Morris, G., Harshman, N., Branum-Martin, L., Mazur, E., Mzoughi, T., & Baker, S. (2012). An Item Response Curves Analysis of the Force Concept Inventory. *American Journal of Physics, 80,* 825–831. https://doi.org/10.1119/1.4731618

Murphy, R., & Broadfoot, P. (2017). *Effective Assessment and the Improvement of Education: A Tribute to Desmond Nuttall*. Routledge. https://doi.org/10.4324/9780203732618

Popham, W. J. (2020). *Classroom assessment: What teachers need to know* (Ninth edition). Pearson.

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Artificial Intelligence in the Classroom: Supporting Teachers in Addressing Electrical Engineering Preconceptions

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Abstract

This research paper examines the suitability of AI tools for teaching the fundamentals of electrical engineering. The research question addressed in this paper focuses on the quality of AI-suggestions to counteract the preconceptions (misconceptions) in courses for first-year students. To address this question, a generative AI tool is examined regarding the identification of preconceptions and measures within learning processes. Subsequently, the author undertakes a systematic evaluation of all suggestions. The results show that the AI tool identifies numerous potential preconceptions (up to 80), although some of them refer to the same underlying preconception. For instance, the preconceptions "energy and current are the same thing" and "more current automatically means more energy consumption" are equivalent. Furthermore, in the second instance, the AI "unconsciously" introduces a preconception that focuses on energy consumption rather than conversion. Unfortunately, the AI makes such statements in the suggested materials for learners. This can engender further preconceptions. In planning learning-teaching arrangements, AI tools have shown effectiveness in engaging learners by counteracting preconceptions through experimentation and simulations. In summary, despite their limitations, the results of the AI tool can be considered adequate. The amount of generated information may be overwhelming for inexperienced teachers, who may encounter difficulties in identifying the key preconceptions. Consequently, the deliberate integration of AI tools into training programs for (future) teachers is imperative, a point also addressed in this paper.

Keywords: preconceptions, first-year curriculum, electrical engineering, experiential learning

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Introduction

Electrical engineering is widely regarded as an abstract discipline because many of its underlying phenomena cannot be perceived directly by the human senses. For instance, while electrical current can be perceived through its (often dangerous) effects on the human body, it is not possible to directly observe the flow of electrons or the magnetic field generated in the process. This fact makes it particularly challenging for learners at the beginning of their educational programs to grasp the fundamentals of electrical engineering. The issue is further compounded by the abstract nature of the subject matter, which frequently necessitates mathematical modelling of related concepts. This is often challenging for learners to understand, thereby creating an additional hurdle in the learning process.

One approach to conceptualizing abstract content involves the establishment of explanatory patterns, which are often termed "preconceptions." These preconceptions frequently offer valid descriptions of specific situations, providing a helpful framework for learners. However, learners often overgeneralize these explanations and apply them to situations in which they are no longer appropriate.

Future teachers need to understand the concept of preconceptions so that they can, on the one hand, identify unhelpful preconceptions among learners and, on the other hand, create learning opportunities to reduce these unhelpful preconceptions and/or replace them with helpful ones. In this context, the support provided by generative AI tools can be an important option for expanding instruction to address this issue. In accordance with this premise, the present paper will address the following research question: To what extent can generative AI support future teachers in designing lessons on the fundamentals of electrical engineering that explicitly address students' preconceptions?

To answer this research question, ChatGPT is used as an illustrative example whose responses are analyzed from a subject-specific didactic perspective. The background section serves two purposes. First, it serves to contextualize the author's research activities within the domain of subject-specific didactics. Second, it provides a rationale for the selected research topic. Subsequently, the AI tool's results are presented and discussed from a subject-specific didactic perspective. Finally, the paper concludes with a summary and an outlook.

Theoretical Framework

This section introduces constructivist didactics, preconceptions, and the conceptual change framework.

Constructivist Didactics of Electrical Engineering (cDoEE)

Constructivist didactics of electrical engineering (cDoEE) is a subject-specific educational framework that focuses on the fundamentals of electrical engineering (Jambor, 2022). This is because this particular field poses a significant challenge for novices and experienced teachers alike, resulting in a considerable need for support in this field.

Theories of cognition and learning associated with constructivism, as well as approaches of transactional analysis (Stewart & Joines, 1987), serve as the theoretical framework for these considerations on subject-specific didactics. A brief overview of constructivism is provided by, for example, JAMBOR (2024). For the purposes of this paper, it is sufficient to note that

the constructivist approach posits an active construction of one's own knowledge structures and considers direct knowledge transfer between teachers and learners to be impossible. Consequently, the traditional roles of the teacher as the primary knowledge provider are being redefined. The new paradigm places the teacher in a more facilitative and supportive position. Concurrently, the responsibility for one's own learning processes shifts to the learners, since they are the only ones who have control over these processes. Conversely, the role of the teacher shifts towards fostering motivation in learners and cultivating an environment conducive to learning. A positive perspective on human beings is adopted from the perspective of transactional analysis. In its first thesis, entitled "People are okay," the manifesto underscores the principle of human dignity and repudiates the establishment of a hierarchical structure among individuals. Instead, individuals are assigned roles (e.g., teacher, student) in different situations, which may involve a hierarchy in specific areas (e.g., performance assessment). The second thesis, entitled "Everyone has the capacity to think," allocates responsibility for one's own decisions and their consequences to all individuals. Consequently, teachers are neither obligated nor justified in making decisions on behalf of learners. The third thesis focuses on decision-orientation, positing that individuals have the capacity to revise and permanently alter their decisions (Jambor, 2024; Stewart & Joines, 1987).

In accordance with this framework, the following objectives are pursued within the cDoEE (Jambor, 2022):

O1. In the context of the fundaments of electrical engineering, which is frequently characterized by its abstract nature, the *motivation of learners* is a critical success factor in the design of learning and teaching processes. It is imperative to nurture this motivation to ensure the efficacy of these processes.

O2. Teachers should identify *preconceptions* regarding the fundamentals of electrical engineering as either helpful or unhelpful. Helpful preconceptions should be strengthened, whereas unhelpful ones should be reduced or replaced.

O3. The *significance of subject-specific knowledge*, particularly in the domain of the fundamentals of electrical engineering, should be underscored. This knowledge functions as a crucial fundament for more advanced content.

O4. Concurrently, the accumulation of *inert knowledge* should be avoided, ensuring the maintenance of a focus on competency-based instruction. The term "inert knowledge" refers to knowledge that has been acquired by the individual but cannot be spontaneously applied to problem-solving. Access to this knowledge is only possible after a stimulus from the outside world (Renkl et al., 1996).

The primary focus of this paper is on objective O2, although it is imperative to acknowledge the continuous integration of learner motivation (O1) and the reduction of inert knowledge (O4) as inextricable components of effective teaching and learning arrangements. The targeted and meaningful use of appropriate tasks also contributes to O3.

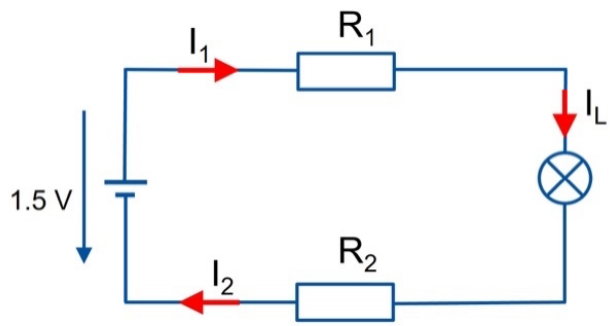
Preconceptions

Preconceptions play an important role not only in the domain of electrical engineering, but also in other fields of education. The development of preconceptions occurs not only within the context of formal learning environments but also in a variety of other informal settings (Adimayuda et al., 2026; El Fathi et al., 2025; Munawwarah & Ashari, 2025). The origins of individual preconceptions are multifaceted, including everyday language (e.g., "Electricity consumption is rising"), language utilized in educational settings (e.g., incorrect use of verbs

such as “Electrical voltage flows.”), perceptual patterns derived from visual representations (e.g., field lines that represent a field and imply field-free space between them), and experiential factors (e.g., connecting a device with a cable and the invisibility of the three wires inside the cable) (Schecker & Duit, 2018). Moreover, analogies (e.g., the water flow model) also foster additional preconceptions.

A frequently observed preconception is illustrated by the circuit depicted in Figure 1. When asked to predict the effect of increasing the resistance R_1, the majority of learners correctly identified a decrease in the current I_L and in the brightness of the lamp. When the resistance R_2 is increased, some learners hypothesize that the brightness of the lamp will remain constant. They justify this phenomenon by asserting that the resistor is situated “behind” the lamp, thereby rendering it ineffective. This preconception is reinforced by the fact that, in most circuits, the resistor intended to limit the current and influence the brightness of the lamp or LED is indeed located “before” the lamp. Additionally, in the German language, the resistor is referred to as a “Vorwiderstand” (pre-resistor), and the required position is implied by the name.

Figure 1
Circuit for Illustrating a Preconception



The author of this paper is unaware of any uniform classification of preconceptions, and thus only a few examples of individual approaches can be cited here. In German-speaking countries, the following classification approaches are commonly utilized, among others:

1. URBAN-WOLDRON and HOPF (2012):
    a. Electric current as a substance that resides in a battery and then flows through the circuit
    b. Concept of current consumption
    c. Concepts related to electrical resistance (e.g., “An increase in the internal resistance of a voltage source leads to an increase in the electric current flowing through the circuit”)
    d. Localized thinking (e.g., “At every junction, the current decides anew how to split”)
    e. Sequential argumentation (e.g., “The magnitude of the current before and behind a component is influenced only by that component”)
    f. Problems with topological structure (e.g., “A parallel connection is only recognized if it is explicitly shown as parallel.”)
2. WILHELM and HOPF (2018):
    a. Concepts from early science learning (e.g., “A single wire from the battery to the consumer is sufficient”)
    b. Concepts related to voltage (e.g., “Voltage is a property of electric current, so a voltage drop occurs even without a resistor”)

   c. Concepts regarding electricity as a fuel (e.g., “Electricity is consumed”)
   d. Basic thinking patterns (e.g., “local thinking”)
3. SCHORN, ABLAß and VOIGHT (2023):
   a. open and closed circuits
   b. series and parallel circuits
   c. electric current
   d. electrical resistance
   e. electrical voltage

The aforementioned approaches are all centered on the rudimentary electrical circuit and lack a more sophisticated grasp of the fundamentals of electrical engineering. This can be attributed primarily to the fact that the underlying studies were conducted in general education schools as part of the physics curriculum, as well as during the introductory phase of university programs.

In addition to comprehending preconceptions, identifying them poses a significant challenge for teachers. This aspect will be further demonstrated using the example illustrated in Figure 1. It is conceivable that, when the resistance R_2 is increased, learners will infer a reduction in the current and the brightness of the lamp. However, it is important to note that this conclusion may be based on a false preconception. If learners assume that, in the physical direction of current flow, resistor R_2 is located before the lamp, the teacher may fail to recognize the incorrect conclusion. Therefore, learners must consider both cases.

Conceptual Change

Learners initially perceive their preconceptions as helpful, which leads them to retain them without the motivation to modify or supplant them with alternative preconceptions. POSNER et al.’s Conceptual Change Theory provides a useful framework for addressing unhelpful preconceptions. The authors identify four conditions necessary for the elimination of unhelpful preconceptions and the development of helpful ones (Posner et al., 1982):

1. Learners must experience dissatisfaction with their existing preconception in order to regard it as unhelpful.
2. The new concept, to be incorporated into cognitive structures as a helpful preconception, must have been understood (at least in part).
3. The new concept must be comprehensible, at least in part, and thus plausible to the learners.
4. The new concept must be transferable to new problems.

To satisfy the first condition, it is necessary to deliberately create cognitive conflicts among the learners. The author of this paper begins by requesting that the learners articulate their hypotheses concerning a particular phenomenon. Subsequently, the learners engage in a discourse with their peers to discuss these hypotheses. Consequently, experiments are conducted with the specific objective of refuting their existing preconceptions.

In the example illustrated in Figure 1, learners are instructed to formulate a hypothesis regarding the functionality of resistor R_2 and subsequently construct the associated circuit. The observations and measurements derived from the circuit demonstrate that learners' preconceptions are unhelpful. This fosters dissatisfaction with the existing preconception.

Results of the AI Query

In light of the widespread adoption of the AI tool ChatGPT, which was utilized by 48% of European students in 2025 (Lademann et al., 2026), GPT-5.5 serves as the illustrative case for this study. Given that the objective of this study is not to generalize the results but rather to conduct a subject-specific didactic evaluation of them, this provides an appropriate starting point for addressing the research question. The AI was prompted to assume the role of a novice vocational school teacher preparing to teach introductory electrical engineering. The author's own prior knowledge regarding preconceptions was presented as negligible.

The inquiry regarding the potential preconceptions in the domain of the fundamentals of electrical engineering has yielded a total of 80 suggestions. At the author's behest, each recommendation is articulated in a single sentence. Moreover, the preconceptions are grouped into twelve categories. The following list contains all categories along with two first exemplary preconceptions from each category. The number of preconceptions assigned to each category is indicated in brackets following the category name. The terms, which were originally provided in German, have been translated but not optimized or corrected for technical accuracy.

C1.Electricity (12)
   a. "Electricity is a substance that is consumed." (Electricity is thought of as a material substance that becomes "less" or disappears in electrical devices.)
   b. "Electricity is used up in the lamp." (The lamp is regarded as the endpoint of the current, beyond which nothing flows anymore.)

C2.Voltage (8)
   a. "Voltage is a current." (Voltage is misunderstood as something that flows.)
   b. "Voltage flows through wires." (Voltage is thought of in the same way as current.)

C3.Resistance (7):
   a. "Resistance completely stops the current." (Resistance is understood as a blockage, not as a limiting factor.)
   b. "Resistance weakens the current until it disappears." (The current is thought to decrease along the resistance.)

C4.Series (5) and parallel (5) circuits
   a. Series circuit: "The current is divided among the lamps." (An incorrect application of the parallel model to the series circuit.)
   b. Parallel circuit: "More lamps make each lamp dimmer." (Everyday logic: "more loads = less power")

C5.Electrical circuits (6)
   a. "Current flows only away from the positive terminal" (The closed circuit is not fully understood.)
   b. "One wire is enough" (The need for a return wire is unclear.)

C6.Switches (5)
   a. "Switch either lets current through or holds it back" (The switch is interpreted as a storage device.)
   b. "Switch consumes power" (It is perceived as an active load.)

C7.Measurements (8)
   a. "Measuring instruments always show correct values" (Measurement limitations and conditions are not considered.)
   b. "Voltage and current are measured the same way" (Different measurement methods are not known.)

C8. Circuit diagrams (5)
   a. "Circuit diagrams are to scale" (Geometry is overemphasized.)
   b. "The length of a wire in the diagram affects the current" (The graphical representation is interpreted in physical terms.)

C9. Energy and power (5)
   a. "Energy and current are the same thing" (Temporal aspects are missing.)
   b. "More current automatically means more energy consumption" (The role of time is ignored.)

C10. Power sources (5)
   a. "A battery is a current storage device" (Charge separation and chemical processes are unknown.)
   b. "A battery always delivers the same amount of current" (The influence of the circuit is ignored.)

C11. Safety (4)
   a. "Voltage is harmless; current is dangerous" (The danger posed by high voltage is underestimated.)
   b. "Low voltages are generally harmless" (Factors such as the environment and body resistance are not considered.)

C12. System level (5)
   a. "Components operate independently of one another" (Interactions are not recognized.)
   b. "Each component can be considered in isolation" (System thinking is lacking.)

In order to expand the systematization of preconceptions within the categories, seven conceptual models are provided. These can be regarded as a higher-level framework that groups individual preconceptions into overarching explanatory patterns. These are presented below, with a concise explanation by the author to accompany each. Furthermore, two preconceptions are invariably enumerated that the AI tool has assigned to the conceptual model. In instances where preconceptions have been previously mentioned, only a reference is provided here.

CM1. Substance model: Learners view electric current as something that behaves like a liquid (especially water) or a gas (especially air). This substance can be consumed, divided, and stored.
   a. see C1a and C1b

CM2. Linear transport model: Learners attempt to explain individual phenomena using the idea that electric current is transported from the source to the load. The circular nature of the process is neglected.
   a. see C1b
   b. "The first lamp (in a series circuit) has a stronger influence on the second." (Linear cause-and-effect thinking dominates.)

CM3. Agent model: Learners attribute intentions, or a certain "intelligence", to the components.
   a. "Current flows in only one direction because the lamp determines it." (The load is seen as the controlling element of the current flow.)
   b. "One lamp draws current away from the other" (Loads are thought of as actively "taking" current.)

CM4. Local cause-and-effect model: Learners assume a component in a circuit has only a local effect and neglect its impact on the entire circuit.
   a. see CM3a

b. “Changes only have a local effect” (Global effects in the circuit are underestimated.)

CM5. Mechanical force model: Learners replace invisible electrical quantities (e.g., current, voltage) with mechanical quantities (e.g., pressure, force).
   a. “Current is dangerous because it exerts pressure.” (Danger is interpreted mechanically, not in terms of effects on the body.)
   b. “Voltage is the force of current” (Mechanical analogies dominate the conception.)

CM6. Measurement and representation model: Learners assume that measurements and representations are direct copies of reality. In doing so, they neglect measurement errors and limitations in modelling.
   a. see C7a and C8a

CM7. Additive-summative system model: Learners view circuits as a loose collection of components that do not interact with one another, and do not contribute collectively to the circuit’s function.
   a. see C12a and C12b

Based on these conceptual models, the AI suggests a central hypothesis that all preconceptions can be traced back to a single cause. This is the learners’ belief that electricity is a transportable substance.

The AI tool identifies four main challenges as factors in the identification of preconceptions. Firstly, linguistic overlay is defined as the use of correct terminology by learners without the corresponding conceptual understanding of the underlying meanings. This phenomenon leads to the masking of preconceptions by correct answers. A secondary issue pertains to academic adaptation, whereby learners are expected to commit to memory formulae, rules, and terms. This enables them to provide correct answers on knowledge-based tests that lack real-world application and to “conceal” their preconceptions. A similar issue is the context-dependence of preconceptions, which, on the one hand, enables the correct calculation of theoretical problems and, on the other hand, prevents the application of knowledge to everyday situations. Finally, the issue of indirectness is a challenge identified by the AI tool, which highlights that preconceptions are often not directly accessible and can only be discovered through the teacher’s interpretation. The issue of identification, as mentioned in the discussion of preconceptions, can be assigned specifically to this category. It is important to acknowledge that this issue can result in preconceptions being overlooked or, through overinterpretation, being attributed to the learners.

In order to identify preconceptions, the AI tool provides a checklist upon request to assist teachers. For each preconception or group of preconceptions, a checklist containing 2–3 items is provided. The following examples illustrate the items for preconceptions C1a and C7a:

- C1a
  - Does the student mention “less electricity behind the lamp”?
  - Is electricity described as a limited resource?
  - Is the concept of a closed loop missing?
- C7a
  - Is critical thinking about measurements avoided?
  - Is no interpretation provided?

In terms of counteracting preconceptions, the AI Tool highlights that (unhelpful) preconceptions are relatively stable and must be destabilized and reorganized through the

introduction of competing (helpful) preconceptions. Moreover, this context underscores the phenomenon that helpful and unhelpful preconceptions can coexist (e.g., one's own explanatory model vs. the memorized answer for the teacher). Based on this "understanding," a three-step approach is proposed. Firstly, the everyday model (unhelpful preconception) is activated. Secondly, conflict is deliberately generated through experiments. Thirdly, a new model (helpful preconception) is incorporated into the cognitive structures as a replacement. The AI tool integrates this approach into the conceptual change approach described above, even though the author did not explicitly mention it.

Interpretation of the Results

The complete interaction with the AI tool comprised approximately 130 A4 pages of output, with less than 1% of the content being produced by the author of this paper. Consequently, the volume of information that a prospective teacher must review during the evaluation process is substantial. Moreover, individual statements from the AI tool are reiterated, as they are rearranged and summarized upon request.

An examination of the 80 preconceptions reveals the presence of some duplications. Initially, genuine duplications can be identified, in which individual preconceptions are repeated almost identically. For instance, the preconception C1b is reiterated as the preconception "No more electricity flows past the last lamp." A similar duplication can be observed with the preconceptions C5b and "The circuit does not need to be closed." Such duplications can be identified eleven times, thereby reducing the original 80 preconceptions to 69. Additionally, individual repetitions can be traced back to shared causes, thus enabling their identification as duplicates. For instance, preconceptions C2a, C2b, and "Voltage is consumed" can be replaced by the preconception "Voltage as a flowing substance." A parallel consolidation can be identified in the context of viewing components as "independent" actors. Therefore, the preconceptions "Current flows in only one direction because the lamp determines it," "A lamp draws current away from the other," "The voltage source distributes voltage as needed," C6a, "The switch determines the brightness," and "The battery decides on the current" can be summarized as "Components make decisions and act purposefully." After removing genuine duplicates and consolidating conceptually equivalent statements, the original list of 80 preconceptions can be reduced to approximately 50 distinct preconceptions.

In addition to the repetition of preconceptions, a taxonomy can be established that distinguishes between *common*, *less common*, and rather *unconventional preconceptions*. This distinction is highly subjective and is based on the experience of the author of this paper, who has worked for a total of approximately 15 years in vocational and academic education as a teacher and lecturer. Additionally, the absence of mention of individual concepts in extant literature is employed as a significant indicator for classifying a preconception as one of the more unconventional types. From the author's perspective, *less common* preconceptions include the following: "Current stays at the negative terminal," "The lamp determines the direction of current," "One lamp draws current away from the other," and "Power is just a property of the device." Examples of more *unconventional preconceptions* include the following: "Electric current is dangerous because it pushes," C5b, "Current flows at different speeds," C3a, "Resistance exists only when current is flowing," and "The switch is a voltage source." It is imperative to acknowledge that the author's experiences are influenced by two primary factors: his learners and his approach in the classroom. For instance, the preconception C5b is more prevalent among younger learners who do not belong to the author's target group. The preconception "Current flows at different speeds"

has never been encountered by the author, since the speed of charge carriers is never explicitly addressed by the author in his teaching arrangements. Consequently, it is possible for learners to hold this preconception and for the author to fail to identify it due to the author's focus.

In addition to the aforementioned limitations, it is important to note that not all of the preconceptions listed are genuine. An illustration of such a "pseudo-preconception" is the preconception "More lamps make each lamp dimmer," which is cited by the AI tool in the context of parallel connections. However, under the assumption of an ideal voltage source, this statement is found to be false. However, if a real voltage source (e.g., a standard battery) is used, learners can make this observation empirically. The statement of the "pseudo-preconception" is only to be considered a preconception when employed in the context of a (nearly) ideal voltage source. Linguistic nuances have the potential to serve as a contributing factor to the occurrence of misunderstandings. For instance, the preconception that "voltage can be measured on a single wire" is not inherently incorrect. The voltage drop can be measured on a wire; therefore, the statement does not represent an unhelpful preconception.

The systematization of the preconceptions using these categories is clear and combines the approaches presented in the fundamentals by URBAN-WOLDRON and HOPF (2012) and by SCHORN, ABLAß and VOIGHT (2023). However, the AI tool supplements these preconceptions with categories focusing on measurements (C7), circuit diagrams (C8), and safety (C11), which are particularly relevant in the fields of vocational and academic education. The correlation between the categories and the conceptual models is clear. In this step, repetitions are removed due to the nature of the approach, thereby increasing the clarity of the list. From the author's perspective, the central thesis, that there is a single common cause for preconceptions, is an oversimplification. Moreover, it offers no direct didactic value, as it can only be used to justify avoiding explanatory models such as the water flow model. This approach effectively prevents the formation of new preconceptions; however, it does not address existing preconceptions that have been formed through various sources, such as the media (e.g., energy consumption) and learners' own observations outside of class (e.g., a cord (with two invisible conductors) for a floor lamp).

To identify preconceptions, the AI tool generates checklists that are particularly useful for novice teachers. This approach presupposes that learners will verbalize their assumptions. A thorough review of the checklists reveals that individual questions are derived directly from the preconception. However, the efficacy of these questions is not consistent. For instance, the preconception "Electric current can accumulate" is employed to formulate the question "Is a current bottleneck being described?" Additionally, the question "Is a static state rather than a process being conceived?" is included in the checklist for the aforementioned preconception. The first question is a natural extension of the preconceived notion and is therefore not explicitly necessary. However, the second question is somewhat misleading. In this context, the use of the term "process" to describe the flow is somewhat unconventional, although it is not necessarily inaccurate. The distinction between a static state and a process is a common element in checklists. This issue is further illustrated by the question "Is the temporal reference missing?" This question also implies describing the current as a static phenomenon. This indicates that distinct questions are devised for equivalent contexts, a situation that can prove particularly daunting for novice teachers.

The strategy for countering preconceptions has been identified in the domain of subject-specific didactics and is, consequently, applicable, as the approach is found on the

Conceptual Change Model. The only aspect that has not been explicitly addressed is the intentional verbalization of everyday notions. It is evident that experienced teachers can interpret the AI tool's output in a manner that validates the efficacy of the suggested approach. However, if the activation of learners' preconceptions during the experiments is only implicit, that is, if it is not verbalized, then the resulting conflicts between their preconceptions and the observed phenomena may be consciously or unconsciously ignored by the learners.

Conclusion and Outlook

In summary, the output of the AI tool is often comprehensive, which may overwhelm novice or prospective teachers. The repetitiveness and, in some cases, imprecise statements can generate uncertainty among the target group, which can have a counterproductive effect. This underscores the necessity of both subject-specific and didactic knowledge, as well as AI competencies, for two key reasons. Firstly, these competencies are essential for formulating precise prompts that elicit specific AI responses. Secondly, they are crucial for evaluating these responses with the requisite critical perspective. It is imperative that this be incorporated into the training of prospective teachers from the outset; however, it should not supersede subject-specific expertise. This is because evaluating AI responses necessitates a certain level of fundamental subject-specific and didactic knowledge. This approach is essential for assuming responsibility for teaching activities and reducing reliance on AI tools. In this regard, it is imperative that AI competencies not be disseminated in a universally applicable manner across all academic disciplines at a university. Instead, it is essential to address the utilization of AI tools in a subject-specific manner and within the context of subject-specific didactic discussions. In the context of the UNESCO Framework for AI Competencies for Teachers (Cukurova & Miao, 2024), this approach is of crucial importance in the context of the aspects "AI Fundamentals and Applications" and "AI Pedagogy," as the focus here is on the purposeful and student-centered use of AI tools within learning and teaching arrangements. The author posits that this objective is unattainable for teachers who possess only general AI competencies.

Subsequent to the filtration of AI outputs, the insights into preconceptions and their corresponding methodologies for remediation can be regarded as being of inestimable value. A substantial amount of accurate and meaningful information is provided that can be used in the design, implementation, and evaluation of learning and teaching arrangements. Furthermore, insight into the concept of preconceptions can be gained expeditiously; however, this insight must be deepened through a more in-depth examination of the topic, particularly by teachers who teach or will teach the fundamentals of electrical engineering.

The next step in the research activities will be to examine the seven conceptual models with regard to their suitability for systematizing preconceptions. The objective of this study is to develop a diagnostic instrument that will assist teachers and encourage additional research on preconceptions in electrical engineering. The employment of AI instruments is poised to assume a pivotal function within this process. The integration of AI competencies with the study of preconceptions in electrical engineering is already taking place at the university where the author of this paper is employed as a faculty member. The development of a seminar concept for (future) teachers, one that can also be applied to other disciplines, is another goal of the author's future research and teaching activities.

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

The author declares that DeepL Write and ChatGPT were used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from DeepL and ChatGPT, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Adimayuda, R., Suhandi, A., Samsudin, A., Suhendi, E., Setiawan, A., Fratiwi, N. J., & Kapici, H. O. (2026). A Review of College Students in Physics Education: Type, Cause and Remediation Misconception. *Journal of Innovation in Educational and Cultural Research, 7*(1), 143–152.

Cukurova, M., & Miao, F. (2024). *AI Competency Framework for Teachers*. UNESCO Publishing.

El Fathi, T., Saad, A., Larhzil, H., Lamri, D., & Al Ibrahmi, E. M. (2025). *Integrating Generative AI into STEM Education: Enhancing Conceptual Understanding, Addressing Misconceptions, and Assessing Student Acceptance*. Disciplinary and Interdisciplinary Science Education Research, vol. 7.

Jambor, T. N. (2022). *Konstruktivistische Fachdidaktik der Elektrotechnik* [Constructivist Didactics of Electrical Engineering]. Postdoctoral Thesis, Munich, Germany, Dr. Hut.

Jambor, T. N. (2024). *From Theory to Practice: Improving Learning through Action Orientation in Academic Education.* In 18th International Technology, Education and Development Conference 2024 Proceedings, Valencia, Spain, pp. 2687–2696.

Lademann, J., Henze, J., Honke, N., Wollny, C., & Becker-Genschow, S. (2025). *Teacher Training in the Age of AI: Impact on AI Literacy and Teachers' Attitudes*. In Frontiers in Education, vol. 10.

Munawwarah, M., & Ashari, A. (2025). Unveiling Misconceptions in Chemistry: A Review of Causes, Common Patterns, and Levels of Student Understanding. *Jurnal Studi Guru dan Pembelajaran, 8*(3), 1765–1778.

Posner, G. J., Strike, K. A., Hewson, P. W., & Gertzog, W. A. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education, 66*(2), 211–227.

Renkl, A., Mandl, H., & Gruber, H. (1996). Inert Knowledge: Analyses and Remedies. *Educational Psychologist, 31*(2), 115–121.

Stewart I., & Joines, V. (1987) *TA today: A New Introduction to Transactional Analysis.* Nottingham, England, Lifespace Publishing.

Schecker, H., & Duit, R. (2018). Schülervorstellungen und Physiklernen [Student Preconceptions and Physical Education] In Schecker, H., Wilhelm, T., Hopf, M. & Duit. R. (Ed.), *Schülervorstellungen und Physikunterricht: Ein Lehrbuch für Studium, Referendariat und Unterrichtspraxis* [Students' Preconceptions and Physics Teaching: A Textbook for College, Teacher Training, and Classroom Practice], pp. 1–21.

Schorn, B., Ablaß, M., & Voigt, A. (2023). *Vorstellungen von Studierenden zum elektrischen Stromkreis* [Students' Preconcepts of Electrical Circuits], Didaktik der Physik - Beiträge zur DPG-Frühjahrstagung [Didactics of Physics - Proceedings of the DPG Spring Conference].

Urban-Woldron, H., & Hopf, M. (2012). *Entwicklung eines Testinstruments zum Verständnis in der Elektrizitätslehre* [Development of a Testing Instrument to Assess Understanding in Electricity], Zeitschrift für Didaktik der Naturwissenschaften [Journal of Didactics of the Natural Sciences], vol. 18, no. 2012, pp. 201–227.

Wilhelm, T., & Hopf, M. (2018). Schülervorstellungen zum elektrischen Stromkreis [Students' Preconceptions of Electrical Circuits] In Schecker, H., Wilhelm, T., Hopf, M. & Duit. R. (Ed.), *Schülervorstellungen und Physikunterricht: Ein Lehrbuch für Studium, Referendariat und Unterrichtspraxis* [Students' Preconceptions and Physics Teaching: A Textbook for College, Teacher Training, and Classroom Practice], pp. 115–138.

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Platformization of Public Education in São Paulo, Brazil: Impacts on Teaching Practices and Technological Integration in Natural Sciences and Mathematics

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Abstract

The platformization of public education is characterized by the systematic incorporation of digital platforms, marketed by private companies, which come to mediate the school process. In Brazil, particularly in the State of São Paulo, this movement has reconfigured teaching work by guiding lesson planning and classroom practices, promoting the standardization of pedagogical approaches and restricting teachers' autonomy. This study analyzed how platformization and the use of digital materials, such as ready-made slides, impact teaching practice and the integration of technologies in Natural Sciences and Mathematics education, based on the Technological Pedagogical Content Knowledge (TPACK) model and James Wertsch's concepts of mastery and appropriation. A case study was conducted with teachers through non-participant observations, analyzed using Discursive Textual Analysis (DTA). Initial results indicate that the prescriptive use of these digital materials has become recurrent through imposition and naturalized in teachers' daily routines, no longer representing innovation and starting to reproduce what is already established in these resources. It was observed that other technologies are used mainly, in function of these materials, so that integration occurs as a response to external demands than as a teacher's choice. At certain moments, there were mobilizations of PCK, associated with this naturalization, and of TCK in the use of other technological resources; however, there is no evidence of effective TPACK integration or a critical stance toward these tools. Thus, an operational mastery of technologies predominates, without presenting an appropriation, showing that the analyzed policy doesn't promote innovation and reinforces the technological instrumentalization of teaching work.

Keywords: platformization of public education in São Paulo, digital materials, TPACK, mastery and appropriation

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Introduction

In recent decades, the incorporation of digital technologies into public educational policies has evolved beyond the mere introduction of new instructional resources to constitute a broader process of educational reorganization. This trend, known as the "platformization of education," is characterized by the growing centrality of digital platforms in organizing school activities; these platforms integrate pedagogical practices, administrative processes, assessment systems, and monitoring mechanisms within digital infrastructures developed predominantly by private companies (Van Dijck et al., 2018). Rather than simply providing technological tools, these platforms shape specific ways of teaching, learning, and managing schools, thereby influencing the relationships among teachers, students, and educational systems.

This transformation aligns with a broader trend of expanding platform capitalism, in which data, algorithms, and monitoring processes play a strategic role in organizing various social sectors, including education (Zuboff, 2020). In this context, technologies cease to be neutral tools and instead embody political, economic, and pedagogical rationales that directly influence the organization of teaching work (Selwyn, 2017). Thus, understanding the integration of educational platforms requires moving beyond strictly technical analyses and recognizing that their implementation is linked to conflicts regarding curriculum organization, teacher autonomy, and the very social function of the school.

In the State of São Paulo, the platformization of education has become entrenched through a coordinated set of public policies that go beyond the mere incorporation of digital technologies into the school environment. An analysis of these policies reveals five movements characterizing this process. The first involves the adoption of digital instructional materials organized into pre-structured presentations that are mandatory for classroom use, which redefine pedagogical planning and curricular organization. The second consists of shifting the state school system's teacher professional development to digital platforms, structured primarily around video lessons and focused on the use of these materials. As Carvalho (2022), this dynamic promotes a centralizing pedagogical standardization that directly restricts the teacher's freedom of chairs and local autonomy. The third movement concerns the acquisition and implementation of platforms designed to manage various dimensions of school life, encompassing pedagogical and administrative aspects as well as the monitoring of student learning. According to Maldonado and Jacomini (2024), this structural shift transforms the Secretaria Escolar Digital into a logic of total business intelligence, aligning public administration with market-driven metrics.

Next, there is a centralization of monitoring regarding access to and usage time of these platforms by teachers and students, enabling the continuous generation of data for educational management purposes. This movement operationalizes what Van Dijck, Poell and de Waal (2018) describe as datafication, where the continuous extraction of user data serves as infrastructure for accountability and managerial governance.

Finally, the institutional narrative is reinforced by linking the use of digital platforms to improved student performance in the São Paulo State School Performance Assessment System (SARESP), thereby strengthening the view that intensifying the use of these technologies is central to raising the quality of public education.

The expanded use of educational platforms has been accompanied by the adoption of mandatory digital instructional materials, the intensification of systems for monitoring

schoolwork, and the linking of platform usage to official educational performance indicators. As discussed by Barbosa and Alves (2023), the platformization of public education has contributed to reinforcing processes of curricular standardization and the centralization of pedagogical decision-making, progressively restricting the scope for teacher authorship and autonomy. Along similar lines, a technical note prepared by the Public School and Democracy Group (Gepud) and the Public School and University Network (Repu) argues that such policies extend mechanisms of control over teaching work by tying platform usage to management based on institutional indicators and targets (Gepud & Repu, 2025).

In this context, the adoption of digital materials within the São Paulo state school system warrants attention; these materials are organized into pre-structured presentations that guide the lesson sequence, the content covered, the proposed activities, and, in many instances, the pace of the teaching process itself. Although these resources are often touted as tools capable of fostering pedagogical innovation and facilitating technology integration, their use can take on a predominantly prescriptive nature, shifting the teacher from the role of architect of pedagogical practices to that of an executor of pre-defined sequences.

This discussion becomes particularly relevant when analyzed through the lens of the *Technological Pedagogical Content Knowledge* (TPACK) model, developed by Mishra and Koehler (2006) based on Shulman's (1986) proposal regarding *Pedagogical Content Knowledge* (PCK). The model posits that the meaningful integration of technologies relies on the interplay between technological, pedagogical, and content-specific knowledge, extending beyond mere instrumental mastery of digital tools. From this perspective, the educational use of technology entails planning and decision-making processes in which the teacher critically selects the resources best suited to learning objectives and the characteristics of the teaching context.

However, understanding merely which forms of teaching knowledge are mobilized is insufficient for analyzing the impacts of platformization on pedagogical work. To broaden this discussion, this study also draws upon Mediated Action Theory (MAT), proposed by James Wertsch (1998), specifically the concepts of mastery and appropriation.

Against this backdrop, this study analyzed how the use of digital materials provided by the São Paulo state school system influences teaching practice and the integration of technologies in the teaching of Natural Sciences and Mathematics. Specifically, the aim was to understand which forms of knowledge from the TPACK model are mobilized during the use of these resources and to what extent their usage demonstrates processes of mastering or appropriating digital technologies, based on preliminary results from a qualitative study involving the observation of a Chemistry teacher in the state public school system.

Technological Pedagogical Content Knowledge (TPACK)

The increasing presence of digital technologies in educational processes has expanded discussions regarding the knowledge teachers need to meaningfully integrate these resources into their teaching practices. However, the mere availability of technologies does not guarantee their pedagogical use, making it necessary to understand how different types of knowledge are combined in teaching practice. In this context, the Technological Pedagogical Content Knowledge (TPACK) model, proposed by Punya Mishra and Matthew J. Koehler (2006), extends Lee S. Shulman's (1986) framework by incorporating technological knowledge as a constitutive dimension of teaching practice.

Shulman's (1986) proposal marked a milestone by arguing that teaching relies neither solely on mastery of subject matter (*Content Knowledge* – CK) nor merely on knowledge of teaching methods (*Pedagogical Knowledge* – PK). The author introduced the concept of *Pedagogical Content Knowledge* (PCK), understood as the knowledge required to transform specific content into forms that are pedagogically accessible to students. PCK entails selecting examples, analogies, representations, and instructional strategies that foster learning, thereby constituting a distinct form of professional teaching knowledge.

With the advancement of digital technologies, Mishra and Koehler (2006) argue that integrating these resources requires knowledge that goes beyond the mere use of technological tools. Thus, the TPACK model proposes that teaching practice results from the dynamic interaction among three fundamental types of knowledge: CK, PK, and *Technological Knowledge* (TK). The interplay between these forms of knowledge gives rise to new domains, such as *Technological Content Knowledge* (TCK), *Technological Pedagogical Knowledge* (TPK), PCK itself, and, finally, TPACK, considered the knowledge necessary to integrate technologies in a way that is coherent with pedagogical needs and specific content.

Unlike approaches that view technologies merely as supplementary resources for instructional planning, TPACK is based on the premise that their integration into teaching arises from the interplay among technological, pedagogical, and content knowledge. Consequently, teachers are expected to mobilize this knowledge in an integrated manner to select and use technologies that align with learning objectives, content specifics, pedagogical strategies, and the context in which the practice takes place. As highlighted by Graham (2011) and Koehler et al. (2012), TPACK should not be understood as a set of independent competencies or a linear sequence of knowledge, but rather as an analytical framework capable of capturing the complexity of this interplay across diverse educational contexts.

From this perspective, context plays a central role in the formation of TPACK. Koehler and Mishra (2008) argue that the incorporation of technologies into teaching should stem from a planning process that integrates learning objectives, content, pedagogical strategies, and the characteristics of the educational context, rather than from the prior selection of digital tools. Thus, the selection of technologies is a consequence of this integrated planning, enabling the teacher to intentionally choose the most suitable resources to enhance learning experiences.

However, the literature also acknowledges that the relationship between technology and teaching practice undergoes changes as certain resources become widely incorporated into daily school life. Cox and Graham (2009) argue that when a technology is used continuously, it tends to lose its novelty and comes to be perceived as a natural part of the teaching environment. This process of naturalization means that technological knowledge is no longer easily distinguished as a specific component of teaching practice, becoming instead transparent within pedagogical action. In other words, TK does not disappear, but it ceases to be perceived as knowledge consciously mobilized, as the technology becomes integrated into professional routines much like other resources traditionally used in schools.

Although this discussion was developed within contexts of established technological integration, it holds significant implications for understanding the processes of the platformization of education (Barbosa & Alves, 2023). Consequently, this discussion is particularly relevant to the present research, as it highlights that technological integration depends on more than just the presence of digital tools in the classroom. Instead, it is necessary to analyze how these technologies are incorporated into pedagogical planning and which

professional forms of knowledge are actually mobilized during their use. Thus, in this study, the TPACK model serves as an analytical framework to investigate whether the digital materials prescribed by educational policy foster a meaningful integration of technology, pedagogy, and content, or whether they tend to limit this connection to the operational use of pre-defined resources.

Mediated Action Theory: Mastery and Appropriation

Given that digital technologies not only expand teaching possibilities but can also alter the ways teachers understand and organize their practices, a framework is needed to analyze not only the knowledge mobilized during technology integration but also the relationship established between teachers and these tools within their specific sociocultural contexts. In this regard, the TPACK model is complemented by the Mediated Action Theory (MAT), proposed by Wertsch (1998), which enables an understanding of how cultural tools play a role in shaping human actions and the processes of meaning-making constructed by individuals.

Drawing on the contributions of Vygotsky, Bakhtin, and Burke, TAM shifts the analytical focus from isolated individuals to the relationship established between subjects and mediating instruments, termed cultural tools. From this perspective, these tools do not function as elements external to action but rather participate in its constitution, shaping and transforming the ways in which subjects act in the world. Thus, the central object of investigation is neither the subject nor the tool analyzed in isolation, but rather mediated action, understood as an inseparable unity comprising the agent and the cultural means that make their action possible (Wertsch, 1998). Consequently, while cultural tools expand the possibilities for human action, they simultaneously guide, condition, and delimit the ways in which that action is carried out.

Among the central concepts of this approach, mastery and appropriation stand out. Mastery refers to the ability to use a given instrument operationally, understanding its functioning and properly executing the actions required for its use. However, mastering a tool does not necessarily imply incorporating it into one's own ways of thinking and acting (Wertsch, 1998).

Appropriation, in turn, represents a more complex process of internalization in which the subject not only uses the instrument competently but also assigns personal meanings to it, critically reinterpreting it and integrating it into their own purposes and practices. In this process, the tool ceases to be merely reproduced according to its originally established functions and comes to be imbued with new meaning by the subject; it can be adapted to different contexts and even mobilized as a form of resistance against intended conditions or uses. As Wertsch (1998) highlights, an individual may use a tool with technical competence without necessarily establishing a relationship of identification or incorporation with it, situations characterized by mastery but not appropriation.

In the educational context, this distinction becomes particularly relevant for understanding the use of digital technologies. Giordan (2005) argues that the introduction of technologies into schools does not, in itself, guarantee qualitative changes in pedagogical practices. This is because learning to use these tools can be limited to operational mastery when their use is prescriptive, failing to foster processes of re-signification by teachers, as can happen with platformization.

In this study, the digital platforms and instructional materials provided by the São Paulo state school system are understood as cultural tools that mediate the organization of teaching work.

However, the premise is adopted that their use may occur at varying levels of internalization. While some contexts foster processes of appropriation, in which teachers adapt, reinterpret, and transform technological resources to meet instructional needs, others tend to restrict this possibility, predominantly favoring an operational mastery driven by adherence to institutional mandates.

Linking TAM with the TPACK model thus enables a more comprehensive analysis of the integration of these technologies. While TPACK allows for the identification of the professional knowledge mobilized during teaching practice, the concepts of mastery and appropriation make it possible to understand the quality of this relationship, revealing whether the use of technologies stems from autonomous pedagogical choices or from adaptation to, or resistance against, the demands imposed by the mediating tools present in the school context.

Methodology

This research is qualitative in nature and was conducted as a case study (Yin, 2001), as this approach enables an in-depth investigation of contemporary phenomena within their real-world contexts. The study is part of broader research seeking to understand the impacts of the platformization of public education in São Paulo on the work of teachers and the mobilization of professional knowledge among Natural Sciences and Mathematics teachers.

The study was conducted with four teachers from the São Paulo (SP) state public school system, working in public schools in the municipality of Campinas (SP). However, as the research is still ongoing, this article presents preliminary results obtained from the observation of a chemistry teacher who uses exclusively the digital materials provided by SEDUC-SP to conduct her classes.

Data generation was carried out through non-participant observations (Lakatos & Marconi, 2003), aimed at understanding how digital materials influence the organization of teaching practice, the conduct of classes, the integration of technologies into instruction, and the professional knowledge mobilized by the teacher during the teaching process. This technique was chosen because it enables the analysis of teaching practice in its natural context, allowing for the identification of how platformization policies materialize in the daily life of the school.

The records produced during the observations were subjected to Discursive Textual Analysis (DTA), as proposed by Moraes and Galiazzi (2016). This analytical method unfolded in three complementary movements: (i) unitarization, a stage in which the records were broken down into units of meaning related to the research objectives; (ii) categorization, a phase in which these units were grouped based on theoretical and interpretive affinities; and (iii) production of metatexts, aimed at constructing broader understandings of the phenomenon under investigation by linking empirical data with the adopted theoretical framework.

The categorization phase was guided by *a priori* categories derived from the two theoretical frameworks underpinning the research. The first is the TPACK model proposed by Mishra and Koehler (2006), used to analyze the professional knowledge mobilized during the integration of digital technologies into teaching. The seven categories comprising the model (CK, PK, TK, PCK, TCK, TPK, and TPACK) were taken into account. Using these categories made it possible to identify the knowledge mobilized during teaching practice and the manner in which technology integration occurred within the observed context.

The second corresponds to James Wertsch's (1998) TAM framework, specifically the concepts of *mastery* and *appropriation*, used to understand the process of internalizing these cultural tools. Based on this framework, three analytical categories were defined: Mastery and Appropriation, characterized by operational mastery coupled with critical, autonomous, and transformative use of the technology; Mastery and Non-Appropriation, where the teacher possesses technical mastery of the resources but their use remains restricted to fulfilling institutional mandates, without pedagogical adaptation; and Non-Mastery and Non-Appropriation, characterized by an absence of both technical mastery and meaningful integration of the technology into pedagogical practice, as well as resistance or adaptation to other contexts.

Integrating the TPACK model with the concepts of mastery and appropriation made it possible to simultaneously analyze which forms of teacher knowledge were mobilized during classes and the extent to which the use of digital technologies represented a process of pedagogical appropriation, or merely operational mastery resulting from the demands of the São Paulo state school system's platformization policy.

Results and Discussion

The results presented correspond to the initial stage of ongoing research and focus exclusively on the observation of a Chemistry teacher in the São Paulo state public school system who conducts her classes using only the digital materials provided by the São Paulo State Department of Education (SEDUC-SP). Although this is a single case study, its analysis offers insight into how platformization policies shape daily school life and influence the mobilization of teachers' professional knowledge.

The interpretation was constructed based on *a priori* categories grounded in the TPACK model (Mishra & Koehler, 2006) and the concepts of mastery and appropriation proposed by Wertsch (1998), seeking to understand both the knowledge mobilized and the way digital technologies are internalized during pedagogical practice.

Digital Materials as an Organizing Structure for the Lesson

The observations indicate that digital materials play a central role in organizing teaching practice, serving as the primary structuring element of the observed lessons. Throughout the observation period, the slides provided by SEDUC-SP shifted from a merely complementary role in the teacher's planning to guiding the sequence of content, the lesson's timing, the examples presented, the proposed activities, and the moments of interaction with students.

In this context, the teacher conducted her classes by following the structure previously established by the material, making interventions primarily when questions arose or when she identified a need to tailor the explanation to the class's characteristics. These interventions demonstrate the presence of her own pedagogical decisions; however, they remained focused on the manner of content presentation, without significantly altering the previously defined didactic organization.

Thus, although the teacher makes adjustments while conducting the lessons, the general structure of the practice remains conditioned by the Digital Material. The selection of content, the sequence of presentation, and the proposed activities are already embedded in the resource,

shifting part of the decision-making traditionally associated with lesson planning to the technological artifact itself.

This configuration alters the relationship between the teacher and the instructional material. Instead of serving as a support resource developed based on the teacher's pedagogical choices, the Digital Material acts as an organizing reference for teaching practice, pre-establishing aspects that historically constitute the exercise of professional autonomy.

Another recurring aspect observed was the process by which the use of digital materials became normalized. At no point was their presence treated as a specific methodological strategy or as an innovation incorporated into teaching; rather, their use appeared as part of the school routine, understood as the expected way of conducting classes.

This naturalization allows us to understand that platformization goes beyond the mere introduction of technologies into education. It involves a reorganization of school practices in which technology comes to establish parameters for the conduct of teaching work.

From this perspective, the teacher does not use Digital Materials because she considers them the best strategy for specific content, but rather because they have become the central reference point for the development of school activities. Technology, therefore, ceases to be merely one possibility among various methodological alternatives and assumes a normative position within pedagogical practice.

This movement aligns with discussions regarding the platformization of education, in which platforms cease to function merely as digital tools and begin to organize pedagogical, curricular, and administrative processes (Vieira & Ferraro, 2025). The result is a progressively standardized practice, the logic of which is defined externally to the teacher.

The prevalence of digital materials also influences how other technologies are incorporated into lessons. Although there were instances where the teacher used supplementary resources, such as images, quick internet searches, and digital simulators, these elements primarily served to support the content already structured by the official slides.

In other words, these resources did not constitute new methodological approaches or reorganize the class dynamics; rather, they were used to supplement explanations, clarify questions, or facilitate the visualization of specific chemical concepts. The additional technology, therefore, did not displace the logic established by the Digital Material; on the contrary, it was incorporated to reinforce it.

This characteristic is important for understanding the mobilization of teacher knowledge, which is subsequently analyzed using the TPACK model. Although various technologies are present in the observed practice, their use occurs predominantly within a pre-established pedagogical framework; this may limit the possibilities for a broader integration of technological, pedagogical, and content knowledge (Koehler & Mishra, 2008).

Mobilization of Teacher Knowledge Based on the TPACK Model

The analysis based on the TPACK model categories revealed that the teacher draws upon various forms of professional knowledge while conducting lessons. However, initial results suggest that this mobilization occurs predominantly in isolation or through partial connections

between certain domains of the model, with no evidence of a consistent integration of the seven knowledge components that characterize TPACK.

CK is evident in the confidence with which the teacher addresses the chemical concepts found in the digital materials, answering students' questions and supplementing explanations when necessary. At the same time, PK is observed in the management of the class, the organization of the lesson, and the mediation of student interactions; TK is seen in the use of software integrated into the digital materials, such as PhET Colorado, during lessons. The use of slides is treated as a standard practice, given that they are employed in every class (Cox & Graham, 2009).

The primary form of knowledge mobilization identified during the observations relates to PCK. This mobilization occurs, above all, when the teacher modifies the way she explains specific concepts, uses additional examples drawn from the students' daily lives, or expands upon information found in the official slides. These interventions demonstrate that the teacher does not simply read the material mechanically, but rather mobilizes pedagogical knowledge to facilitate the understanding of the content.

However, these adaptations remain sporadic and localized. At no point was a significant reorganization of the instructional sequence, lesson objectives, or activities proposed by the digital materials observed. The changes focus primarily on expanding explanations and inserting supplementary examples, while preserving the pedagogical structure originally defined by the material. Thus, although PCK is being mobilized, it occurs within the limits established by the prescribed logic of the slides themselves.

Another connection observed relates to TCK. At times, the teacher employs complementary technological resources, such as simulators from the PhET Colorado platform, animations, and other digital resources linked to or integrated with the Digital Materials themselves, to facilitate the understanding of specific chemical concepts. In these instances, technology is used to represent scientific phenomena more dynamically, establishing a link between the technological resource and the specific subject matter.

However, even this mobilization of TCK remains tied to the logic of Digital Materials. The additional technological resources neither reorganize the lesson's pedagogical approach nor foster new teaching strategies; instead, they are primarily used to complement planned activities or to delve deeper into content already presented in the official slides.

On the other hand, few situations were found that allowed for characterizing the mobilization of TPK, since the technologies were not employed to transform teaching methodology, promote different forms of interaction, or foster inquiry-based processes led by the students. Their use remained predominantly associated with the implementation of the instructional sequence pre-organized by the digital materials.

In this context, initial results suggest that the integration of technology, pedagogy, and content occurs in a limited manner. Although various forms of teacher knowledge are constantly mobilized, they tend to appear relatively independently or through partial connections, particularly between PCK and TCK, without constituting a broad, dynamic integration of the seven domains proposed by the TPACK model.

This configuration may be linked to the specific model of platformization under analysis. By providing a pre-structured instructional sequence, complete with defined content, activities, and technological resources, these digital materials reduce the scope for teachers to engage in autonomous lesson planning. Consequently, technology tends to serve primarily as a means of executing a prescribed pedagogical approach, thereby limiting opportunities for teachers to independently integrate their technological, pedagogical, and content-specific knowledge into the process of shaping instruction.

Between the Mastery and the Appropriation of Digital Platforms

An analysis of the professional knowledge integrated by the teacher reveals that her relationship with Digital Materials aligns predominantly with the category of "Mastery without Appropriation" (Wertsch, 1998). Observations indicate that the teacher possesses technical mastery of the resources provided by the state school system. She uses the Digital Materials confidently and fluidly, demonstrating familiarity with their controls, organization, and functionality.

However, this mastery remains confined to the operational level. The Digital Materials are used in their original form, undergoing minimal modification and guiding virtually all decisions regarding lesson organization. The teacher makes specific adjustments during her explanations, yet these changes do not alter the pedagogical approach embedded in the technological resource.

Thus, the use of technology remains strongly tied to institutional mandates. The resource is incorporated into daily school life without undergoing a process of re-signification that would transform it into a tool for pedagogical authorship (Barbosa & Alves). Although the teacher demonstrates knowledge and use of the tool, her practice continues to be structured around possibilities pre-defined by educational policy.

No characteristics consistent with the "Mastery and Appropriation" category were identified, as there were no observed instances of systematic processes involving the reconstruction of material, the development of original strategies, or the critical use of technologies capable of significantly altering class organization, nor was there any resistance to their use. Likewise, the "Lack of Mastery and Appropriation" category does not apply to the case analyzed, given that technical mastery of the resources was evident throughout the observed period.

These initial results suggest that the platformization policy under analysis primarily fosters processes of operational mastery while offering limited opportunities for teachers to develop a critical appropriation of digital technologies. In this context, technology integration tends to occur in response to institutional demands and the pedagogical model pre-established by the digital materials, shifting a portion of teacher autonomy to the technological resources and reinforcing the standardization of pedagogical work (Barbosa & Alves, 2023; Vieira & Ferraro, 2025). This dynamic helps explain why the integrated mobilization of knowledge envisioned by the TPACK framework remains limited: when lesson organization is pre-defined by the materials, there is less scope for teachers to articulate their technological, pedagogical, and content knowledge in an original, self-directed manner (Koehler & Mishra, 2008, Mishra & Koehler, 2006).

Conclusion

The preliminary results of this research demonstrate that the use of the digital materials provided by SEDUC-SP goes beyond merely introducing a new tool into the school routine; instead, it reorganizes the very dynamics of teaching practice. In the case analyzed, these resources were observed to play a structuring role in lesson organization, guiding the sequence of content, proposed activities, and pedagogical approaches. Although the teacher intervenes and draws upon her professional knowledge to adapt explanations and foster student understanding, these actions remain constrained by the structure pre-established by the material, indicating a process of incorporation characterized by the centrality of technological prescription.

Analysis based on the TPACK model revealed the mobilization of various forms of teacher knowledge, specifically CK, PK, TK, PCK, and TCK. However, this mobilization was only partial, failing to demonstrate the comprehensive integration of technology, pedagogy, and content that characterizes TPACK. This result suggests that the mere presence of digital technologies does not guarantee meaningful pedagogical integration, as such integration depends on the possibilities afforded by the planning context and on teacher autonomy regarding the selection, adaptation, and recontextualization of technological resources. When technologies arrive accompanied by pre-defined instructional sequences, content, and activities, the scope for teachers to construct their own practice may be diminished.

Integrating the TPACK framework with Mediated Action Theory revealed that, in the observed context, the relationship the teacher established with digital materials aligns more closely with the category of *mastery* rather than *appropriation*. In other words, while there is technical mastery of the resources and the ability to use the tools, the processes of transforming these instruments to meet specific pedagogical needs remain limited. These initial findings suggest that the platformization policy under analysis tends to foster a predominantly operational relationship with digital technologies, reinforcing the standardization of teaching work. However, as this research is ongoing, further investigation is required to deepen our understanding of how different teachers, school contexts, and training conditions influence the processes of technology appropriation in the teaching of Natural Sciences and Mathematics.

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

The author declares that Grammarly, an AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from Grammarly, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

References

Barbosa, R. P., & Alves, N. (2023). A Reforma do Ensino Médio e a plataformização da educação: Expansão da privatização e padronização dos processos pedagógicos [The High School Reform and the platformization of education: Expansion of privatization and standardization of pedagogical processes]. *Revista e-Curriculum, 21*, 1–26.

Carvalho, L. H. P. de. (2022). Plataformização da educação: Práticas de professores na rede estadual de São Paulo [Platformization of education: Teachers' practices in the São Paulo state school system]. In *Anais do 32º Simpósio Nacional de História* [Proceedings of the 32nd National Symposium of History]. ANPUH.

Cox, S., & Graham, C. R. (2009). Diagramming TPACK in practice: Using an elaborated model of the TPACK framework to analyze and depict teacher knowledge. *TechTrends, 53*(5), 60–69.

Giordan, M. (2005). A internet vai à escola: Domínio e apropriação de ferramentas culturais [The Internet goes to school: Mastery and appropriation of cultural tools]. *Educação e Pesquisa, 31*(1), 57–78.

Grupo Escola Pública e Democracia (GEPUD), & Rede Escola Pública e Universidade (REPU). (2025). *Plataformização e controle do trabalho escolar na rede estadual paulista* [Platformization and control of school work in the São Paulo state school system] [Technical note]. GEPUD; REPU.

Koehler, M. J., & Mishra, P. (2008). Introducing TPCK. In J. A. Colbert, K. E. Boyd, K. A. Clark, S. Guan, J. B. Harris, M. A. Kelly, & A. D. Thompson (Eds.), *Handbook of technological pedagogical content knowledge (TPCK) for educators* (pp. 3–29). Routledge.

Koehler, M. J., Shin, T. S., & Mishra, P. (2012). How do we measure TPACK? Let me count the ways. In R. N. Ronau, C. R. Rakes, & M. L. Niess (Eds.), *Educational technology, teacher knowledge, and classroom impact: A research handbook on frameworks and approaches* (pp. 16–31). IGI Global.

Lakatos, E. M., & Marconi, M. de A. (2003). *Fundamentos de metodologia científica* [Fundamentals of scientific methodology] (5th ed.). Atlas.

Maldonado, L. R. S., & Jacomini, M. A. (2024). *Da secretaria escolar digital ao business intelligence total: Plataformização na rede estadual paulista* [From the Digital School Secretariat to total business intelligence: Platformization in the São Paulo state school system]. *Revista Brasileira de Política e Administração da Educação, 40*(1), e140507. https://doi.org/10.21573/vol40n12024.140507

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Moraes, R., & Galiazzi, M. C. (2016). *Análise textual discursiva* [Discursive textual analysis] (3rd rev. & expanded ed.). Editora Unijuí.

Selwyn, N. (2017). *Educação e tecnologia: Questões críticas* [Education and technology: Critical issues]. In G. M. S. Ferreira, L. A. S. Rosado, & J. de S. Carvalho (Eds.), *Educação e tecnologia: Abordagens críticas* [Education and technology: Critical approaches] (pp. 85–102). SESES.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Van Dijck, J., & Poell, T. (2018). Social media platforms and education. In J. Burgess, A. Marwick, & T. Poell (Eds.), *The SAGE handbook of social media*. SAGE Publications.

Van Dijck, J., Poell, T., & de Waal, M. (2018). *The platform society: Public values in a connective world*. Oxford University Press.

Vieira, L. C., & Ferraro, D. S. e S. B. (2025). *Plataformização e precarização da experiência de aprendizagem na educação básica* [Platformization and the precarization of the learning experience in basic education]. *Caderno Pedagógico, 22*(7), e16366.

Wertsch, J. V. (1998). *Mind as action*. Oxford University Press.

Yin, R. K. (2001). *Estudo de caso: Planejamento e métodos* [Case study research: Design and methods] (2nd ed.). Bookman.

Zuboff, S. (2020). *A era do capitalismo da vigilância: A disputa por um futuro humano na nova fronteira do poder* [The age of surveillance capitalism: The fight for a human future at the new frontier of power]. Relógio d'Água.

Navigating Educational Resilience: Regional Disparities and Institutional Support for Transnational Students' School Adaptation in Taiwan

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Abstract

In the context of global mobility, educational discontinuity poses profound challenges to the educational justice of transnational students. Integrating the "Capabilities Approach" as a technical evaluative framework, this research shifts the focus of educational resilience from individual psychological adjustment to institutional guarantees of "substantial opportunities" and "functionings." This study employs secondary data analysis, using the latest dynamic statistics (N = 2,125) from the Ministry of Education's "Transnational Students Education Network" to conduct spatial distribution and cross-stage comparative analyses. Empirical results reveal a significant "regional clustering" of these students, centered in the Kaohsiung-Pingtung area—led by Kaohsiung City (n = 628, 29.5%)—and northern metropolitan regions, reflecting asymmetries in industrial structure and resource allocation. Notably, the data indicate a failure in "academic language translation" as students transition to junior high school, leading to a marked regression in academic achievement; this highlights the structural vulnerabilities of current cross-stage transition mechanisms. Based on the analysis, this study proposes three concrete practical pathways: establishing dynamic regional support platforms to enhance administrative efficiency in high-demand areas; developing intertextual teaching materials that integrate native linguistic assets to implement curriculum translation centered on "academic language support"; and strengthening the professional agency of teachers as "transformative intellectuals" to reverse institutional exclusion caused by the misalignment of cultural capital through differentiated assessment and three-tier counseling interventions. This exploration not only provides precise optimization suggestions for Taiwan's "New Resident Education Excellence Program" but also offers an empirically grounded, localized dialogue for global discussions on educational justice for migrant and returnee students.

Keywords: transnational students, educational resilience, regional disparities, capabilities approach, transformative intellectuals

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Introduction

Research Background: Resilience Challenges and Sustainable Visions Under Global Mobility

In the postmodern context of global mobility and frequent labor migration, the educational frontline has become the primary arena where diverse cultures collide and merge. In recent years, a distinct group of learners has emerged within Taiwan's educational system: “transnational students,” who frequently navigate between their home countries and Taiwan's schooling system due to parental job reassignments, transnational marriages, or family considerations. According to the latest statistics from the Ministry of Education, the number of transnational students in primary schools alone has reached 2,125, with their spatial distribution exhibiting a striking “regional clustering”—predominantly concentrated in the southern Kaohsiung-Pingtung area and northern metropolitan hubs. Crucially, this high concentration of specific nationalities and educational stages should not be viewed merely as a passive demographic reflection of family reunification; instead, it provides a critical vantage point that exposes the systemic strain on Taiwan's educational policies for second-generation immigrants during the “critical window” of intervention, underscoring an urgent need for precise resource allocation.

The challenges these students confront extend far beyond simple geographical relocation; they experience a profound “educational discontinuity”. This phenomenon does not merely impact the quality of an individual's school adaptation, but directly intersects with the global vision of United Nations Sustainable Development Goals SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities). Without systematic, collaborative institutional transitions, this boundary-crossing life experience can easily relegate students to the margins. Consequently, building an inclusive framework for “educational resilience” has become a vital benchmark for the realization of social justice within Taiwan's school systems.

Problem Statement: Regional Disparities, Resource Allocation, and the Paradigm Shift

Although current policy frameworks have established preliminary counseling mechanisms, practitioners on the ground continue to face severe structural obstacles. Existing Taiwanese literature on this topic frequently centers its analytical lens on individual-level adaptation. While practically valuable, this individualistic perspective methodologically obscures the absence of necessary institutional arrangements. Amartya Sen’s (1999) Capabilities Approach offers a precise diagnostic tool in this regard: genuine educational inequality stems not from students' “disparities in inherent endowment,” but rather from whether institutions provide the “substantial opportunities” required to convert those endowments into actual functionings. Re-evaluating the issue through this theoretical lens allows for a deeper examination across several dimensions:

Asymmetry in Regional Distribution and Resource Allocation

The distribution of transnational students across Taiwan exhibits distinct regional characteristics. Observations indicate that transnational students in the Kaohsiung-Pingtung region predominantly possess Southeast Asian cultural backgrounds, whereas those in northern metropolitan areas are mostly returnees from mainland China. This regional specificity places severe demands on the precision of resource allocation, ranging from the quality of Chinese-language teaching staff to the alignment of professional administrative

support—all of which must be calibrated to local cultural contexts. When the research paradigm shifts from "individual deficit" to "structural deconstruction," these resource asymmetries cease to be mere technical flaws in administrative support; instead, they emerge as a systemic mechanism of "spatial inequality," challenging the system's capacity to build flexible, dynamically adjustable resilience mechanisms.

The Translation Rift in Cultural Capital and the Pitfalls of the "Deficit Model"

The life experiences and linguistic capital accumulated by transnational students in their home countries are frequently treated as "deficits" requiring remediation upon entering Taiwan's mainstream curriculum. This reductive perspective overlooks the latent value of these cultural assets. The educational paradigm must shift from mere "tolerance of difference" to an agency-centered "intercultural" horizon, exploring institutional arrangements that empower students with the capacity for substantive participation. As Taiwanese multicultural education scholars (e.g., Fu, 2004; Wang, 1999) have long argued, placing differences side by side without subjective dialogue becomes a hollow formality. Whether in science education or literacy acquisition, successfully bridging students' pre-existing cultural capital is the decisive linchpin for realizing educational justice.

The Absence of Teachers as Transformative Intellectuals

Teachers represent the most vital mediators of a transnational student's adaptation to school life. However, in the absence of "multicultural literacy," educators frequently struggle to discern the rich, diverse issues students exhibit in their reading or interpersonal interactions, reducing pedagogy to the technical transmission of knowledge. Only when teachers recognize themselves as "transformative intellectuals" can they spark students' boundary-crossing agency and dismantle systemic crises of marginalization. It is worth emphasizing that agency, in Henry Giroux's formulation, does not emanate from the performance mandates of an external bureaucracy; rather, it is forged through a teacher's critical awareness of power misalignments within the classroom. Recognizing this space for teacher agency is fundamentally a process of professional empowerment that resists the depoliticization and technocratization of the classroom.

The core thesis of this study can therefore be articulated as follows: Do Taiwan's current support systems for transnational students—across the three distinct tiers of spatial distribution, curriculum design, and pedagogical practice—constitute a systematic "capability deprivation" that hinders students' development of substantive capabilities?

Research Purpose

The methodological orientation of this study is grounded in a structural interpretation of macro-administrative statistics. It must be clarified that, because this study utilizes secondary data analysis, it does not attempt to empirically measure microscopic classroom instruction. Instead, it seeks to integrate an intercultural horizon with a social justice orientation to construct an inclusive support model. Given the aforementioned context and operational challenges, the analytical focus is anchored on the adaptation issues of primary school transnational students through the lens of regional disparities, pursuing the following concrete objectives:

1. To analyze the regional distribution of primary school transnational students in Taiwan, examining the structural challenges and capability deprivation mechanisms

this distribution presents to regional educational resilience.
2. To investigate how linguistic communication, cultural capital, and teachers' practical knowledge intertwine to influence transnational students' experiences of boundary-crossing in schools, while identifying structural deficiencies across different institutional tiers.
3. To propose an explanatory analytical framework and pathways for policy optimization, serving as a practical guide to align Taiwan's "New Resident Education Excellence Program" precisely with frontline pedagogy.

Current Adaptation Status of Primary School Transnational Students

Institutional Definition and Characteristics: Formal Intervention in Educational Discontinuity

The Ministry of Education employs a rigorous policy definition for "transition and articulation" (銜轉), explicitly distinguishing it from the "transition services" (轉銜) utilized in special education. Transnational articulation focuses specifically on children of immigrant backgrounds whose proficiency in Chinese and continuity within the Taiwanese compulsory education system have been disrupted due to extended residence overseas or in mainland China. According to the regulations of the K-12 Education Administration of the Ministry of Education, these students require systematic counseling to facilitate their integration into the appropriate educational stage. Professor Chung Chen-cheng further refines this academic definition, characterizing them as school-aged children who have received education in a non-Taiwanese compulsory education system or have repeatedly moved between different national educational systems. This definition illuminates the profound "educational discontinuity" these students experience; their rights protection extends beyond those returning to Taiwan for the first time to encompass students holding Republic of China citizenship who frequently move across borders (Wu, 2019).

This reality provides a clear point of entry for incorporating Amartya Sen's Capabilities Approach into the analysis. In his critical reflections on the educational application of the approach, Saito (2003) emphasizes that if educational policies stop at the formal opening of opportunities while ignoring the concrete conditions learners require for transformation, they commit a form of implicit deprivation. Drawing upon this insight, this study conceptualizes the educational dilemma of transnational students as follows: while institutions provide formal access to schooling, they often fail to supply the material conditions for substantive transformation in terms of linguistic scaffolding, cultural articulation, and spatial resource allocation.

Trend Analysis of Spatial Distribution and Source Backgrounds

An examination of dynamic data from the Transnational Students Education Network as of December 2025 reveals a total of 2,994 transnational students across Taiwan's primary, junior high, and senior vocational high schools. Among these, the primary school stage accounts for 2,125 students—an overwhelming 71% of the total (see Table 1)—far exceeding junior high school (740 students) and senior vocational high schools (129 students). This underscores the primary school stage as the absolute critical window for building educational resilience.

Geographically, students are highly concentrated within the six special municipalities, with Kaohsiung City emerging as the prominent hotspot, hosting 628 students (29.5% of the

national primary school total), followed by Taipei City, New Taipei City, and Taoyuan City. This heterogeneity in spatial distribution reflects a complex interplay between "demand density" and "administrative reporting habits". The peak data point in Kaohsiung is both an ecological reflection of southern transnational marriage networks and a revelation of disparities in policy visibility and reporting proactive measures across local governments. This reminds us that any inferences regarding resource allocation must incorporate more refined, contextualized thinking.

Table 1
Core Distribution of Transnational Students by Region and Stage Table (Dec 2025)

Region / Municipality	Senior High	Junior High	Primary School (Open / Closed / Review)	Total	Primary Stage %
Kaohsiung City	8	183	437 (134 / 295 / 8)	628	**29.5%**
Taipei City	50	140	415 (149 / 239 / 27)	605	19.5%
New Taipei City	19	128	394 (286 / 9 / 99)	541	18.5%
Taoyuan City	15	99	301 (166 / 80 / 55)	415	14.2%
Tainan City	6	39	149 (50 / 92 / 7)	194	7.0%
Taichung City	3	41	86 (56 / 26 / 4)	130	4.0%
National Total	*129*	*740*	*2,125 (1,060 / 839 / 226)*	*2,994*	*100%*

Source: Summarized from MOEdynamic administrative data, Dec 2025

In terms of origin, the statistics show a highly diversified background among transnational students. Students of Vietnamese heritage constitute the largest group, totaling 1,222 individuals (40.8%), followed by the United States (263 students, 8.8%), the Philippines (258 students, 8.6%), and Indonesia (196 students, 6.5%) (see Table 2). This dual distribution pattern—centered on Southeast Asian cultural backgrounds alongside English-speaking cohorts—implies that local governments must construct "regional educational resilience" tailored to local contexts. As Huang (2019) notes, students possessing Southeast Asian cultural capital frequently encounter translation thresholds between their home environments and Taiwan's mainstream society.

Table 2
Top National Origins and Core Concentrations of Transnational Students Table

Country of Origin	Total Students	National Percentage	Top 3 Concentrated Districts (Count)
Vietnam	1,222	**40.8%**	New Taipei (242), Taoyuan (233), Kaohsiung (207)
United States	263	8.8%	Taipei (119), Kaohsiung (75), New Taipei (29)
Philippines	258	8.6%	Taoyuan (54), New Taipei (53), Kaohsiung (56)
Indonesia	196	6.5%	Taipei (55), Kaohsiung (35), Taoyuan (35)
Mainland China	113	3.8%	Taipei (51), New Taipei (22), Tainan (15)

Source: Reorganized from MOE statistics, Dec 2025

This regional clustering is by no means accidental; rather, it is deeply intertwined with labor demands rooted in Taiwan's industrial structure and transnational marital support networks. The formation of the southern hotspot reflects the absorption of immigrant labor by specific industrial clusters, meaning that the construction of educational resilience cannot be divorced from an analysis of local socioeconomic contexts. The aforementioned spatial clustering intuitively demonstrates the geographical isomorphism between Taiwan's industrial cluster distribution and transnational marriage migration networks. If resource allocation is driven solely by raw population figures while ignoring the regional heterogeneity of class, ethnicity, and cultural capital, achieving substantive regional educational equity will remain elusive.

Structural Dilemmas of School Adaptation and an International Comparative Horizon

During their initial period of returning to school in Taiwan, children of new immigrants confront profound academic gaps, challenges in daily adaptation, and cultural barriers. Unlike the affluent study-abroad families of earlier eras, contemporary transnational students' families often lack sufficient socioeconomic resources to cushion transnational integration (Huang, 2019). From an administrative standpoint, transnational mobility is frequently sudden and individualized. When dealing with cumbersome administrative procedures, educational authorities often miss the golden intervention window of the first semester due to time lags. This administrative inertia places an institutional barrier in the way of a student's initial adaptation, inflating the long-term costs of subsequent remediation and counseling.

From a curricular perspective, current instructional materials heavily presume native fluency in Chinese. This latent monolingual bias imposes a form of substantive “institutional exclusion” on students from non-Chinese-speaking backgrounds. If a school lacks well-rounded instructional strategies and culturally responsive mechanisms, teachers are often forced to use decontextualized Chinese to teach science or language arts, causing students to lose their sense of self-identity amidst academic frustration. This phenomenon is not merely a linguistic impediment; it represents a structural neglect of students from diverse backgrounds within the very process of curricular knowledge production.

In fact, Taiwan's transnational transition dilemma is not an isolated case. Within East Asia, the policy responses of at least two countries offer valuable comparative benchmarks:

Japan's “Kikokushijo” (帰国子女) Policy

This framework provides systematic reintegration support for the children of Japanese citizens who have lived abroad. Its core logic acknowledges the “transcultural capital” of returnee children and offers time-limited transitional protection. However, Goodman (1990) observes that the institutional protections of the Japanese model's transitional phase often inadvertently reinforce the identity of returnee children as “special others,” rather than fostering genuine intercultural integration. Taiwan's policy design should remain vigilant to avoid similar risks of skyrocketing labels.

Singapore's “Integration Support Programme” for Returnees

This initiative employs a dual-track framework that runs “mother tongue education” parallel to the “mainstream English curriculum”. It allows returning students to gradually integrate into mainstream courses without being forced to abandon their pre-existing linguistic capital.

This curricular design logic of “additive multilingualism” directly aligns with the policy direction of “mother tongue capital translation” advocated in this study.

Through this comparative lens, the unique analytical nature of the Taiwanese case is brought into sharp relief: the cases of Japan and Singapore demonstrate that international migrant education often targets returnees with relative class privilege. In contrast, Taiwan is confronted with a transnational cohort that frequently accompanies the dissolution of transnational marriages, bound up with the dual marginalization of class and culture. Consequently, Taiwan's institutional response must move beyond mere “linguistic remediation” to simultaneously address the far more intricate tasks of identity reconstruction and the rebuilding of family support networks.

A Dialectical Analysis of Factors Influencing Transnational Students' School Adaptation

Research findings regarding the adaptation outcomes of primary school transnational students in Taiwan are highly heterogeneous. One strain of research (e.g., Huang, 2005; Zhou, 2005) contends that ethnic identity does not automatically result in performance deficits, suggesting that under supportive conditions, transnational students can exhibit adaptation qualities comparable to their local peers. Conversely, numerous studies (e.g., Chen, 2005; Lin, 2003) point out that transnational students widely face severe challenges in both psychological adjustment and academic achievement. These determining factors can be analyzed deeply through the frameworks of intercultural education and agency:

The Misalignment and Disconnection of Family Capital

Parents of transnational students are frequently unfamiliar with Taiwan's educational system, which severely restricts their capacity to translate resources or guide their children's academics. From a sociological viewpoint, this is not a reflection of individual negligence, but rather an “articulation failure” between the cultural capital accumulated by the family and the field of mainstream Taiwanese education (Huang, 2019). When the linguistic assets a student developed in their home country are marginalized by the school system, and the family cannot supply institutional compensatory capital, the student easily falls into a state of isolated helplessness. This capital misalignment exposes the invisible filters of class and ethnicity operating within the educational field, demanding systematic institutional rearrangements (Wang, 2020) to endow families with substantive supportive capacity.

Cultural Value Shocks and Boundary Identity Conflicts

Sleeter and Grant (2007) map a spectrum of multicultural education that spans from “teaching the exceptional” to “social reconstructionist.” Currently, Taiwan's transnational curriculum largely remains mired in a “deficit model” that treats difference as a flaw to be corrected. The pronounced differences in social habits and behavioral norms that transnational students exhibit can provoke deep identity conflicts during moments of boundary-crossing interaction.

Wang’s (2020) conceptual distinction between “interculturalism” and “multiculturalism” is vital here: the former emphasizes dynamic dialogue and mutual transformation among transcultural subjects, whereas the latter easily degenerates into a static juxtaposition of differences. If the school environment lacks culturally responsive mediators—such as

multicultural picture books (Liu, 2018) or inclusive reading guidance (Lin, 2013)—students are likely to experience profound frustration when attempting to cross cultural borders, leading to exclusion from mainstream peer groups. This marginalization is fundamentally a failure of "recognition justice" within multicultural education, damaging students' subjectivity through a process of systemic othering.

The Rupture of Educational Stages and Exclusion From Knowledge Production

The data show that while transnational students manage to adapt gradually during the primary school stage ($N = 2,125$), their numbers plummet to 740 upon entering junior high school, accompanied by a marked regression in academic achievement. This pattern invites competing explanations, such as "exiting the transnational status" versus "dropping out due to support failures." In policy practice, one also cannot rule out "administrative sample attrition" caused by the shifting structural demands of junior high school and a more passive administrative reporting habit.

Regardless of which mechanism dominates, this precipitous drop in numbers dramatically illustrates a structural flaw in the current support system: its failure to provide service continuity across educational tiers. It must be noted that this adaptive decline is not a natural degradation of individual capability, but a manifestation of the educational system's retreat from the practice of social justice. Current resource allocation tilts heavily toward initial daily adaptation in primary school, yet leaves a systemic vacuum of linguistic translation support when students confront the highly abstract realm of Cognitive Academic Language Proficiency (CALP) in secondary school. Consequently, the instrumental Chinese proficiency accumulated during primary school evaporated when confronted with highly abstract subject matter in junior high. This failure to articulate subject knowledge structurally excludes learners with transcultural backgrounds from the process of knowledge production, deepening their sense of rupture during school transitions.

Research Methodology

This study utilizes secondary data analysis as its primary research design, systemically re-examining existing datasets to address new research questions distinct from the original data collection objectives. This study draws upon the latest dynamic statistical data from the Ministry of Education's "Transnational Students Education Network" as of December 2025, focusing its analytical scope on the primary school stage ($N = 2,125$).

The operationalization of the "spatial distribution analysis" is structured as follows: using counties and cities as the units of analysis, we calculate the absolute number of transnational students in each municipality alongside their percentage relative to the national total to chart geographical concentration. In doing so, this study intentionally avoids inferential spatial autocorrelation statistics (such as Moran's I) in favor of deep descriptive percentage comparisons. This methodological choice is driven by a core consideration: during an exploratory research phase, precisely mapping the "absolute hotspots" and "resource voids" of administrative reporting delivers more immediate, actionable accountability and policy guidance to the educational administration than pursuing abstract statistical significance. All inferences in this study are strictly bound to the descriptive levels supported by the administrative statistics; discussions touching upon curricular practice and teacher behavior are developed theoretically based on existing qualitative literature.

Support, Resources, and Institutional Arrangements for Transnational Students

Administrative Workflows and Resource Integration: The Justice Logic of the Capabilities Approach

As the research lens shifts from macro-spatial statistics to micro-resource alignment, current administrative workflows become the primary crucible for testing whether formal opportunities can be converted into substantive capabilities. While existing resource delivery models effectively mitigate initial cultural shocks, a support mechanism that over-concentrates on short-term administrative processing while neglecting the long-term demands of cross-stage academic language transition will inevitably trap institutional protections within the confines of "reactive patching".

From the vantage point of the Capabilities Approach, macro-level imprecision in resource allocation exacerbates meso-level monolingual exclusion within curriculum design. Concurrently, the curriculum's institutional indifference toward mother tongue capital ultimately manifests in micro-level classroom settings as pedagogical misreadings by teachers who lack transcultural literacy. The compounding effects of these three institutional deficiencies coalesce into a dynamic network of systemic capability deprivation. Genuine educational resilience must be anchored upon long-term monitoring mechanisms to ensure that social justice does not fracture across educational transitions.

Language as a Medium of Agency: Materials Development and Mother Tongue Capital Translation

While Chinese language remediation is undeniably the most immediate adaptive need for transnational students, language acquisition must not be reduced to a one-way path of assimilation. Beyond deploying materials from the Taiwan Chinese Language Resources Center for remedial instruction, teachers must leverage the textbooks developed by the Ministry of Education for seven Southeast Asian languages, creating institutional spaces for students to exhibit their mother tongue proficiency. If the instructional frontline can organically bridge Chinese remediation with native linguistic assets to develop dialogic, transcultural curricula, it can effectively transform students' marginalized identities. Treating the mother tongue as a "global asset" within the school community not only sparks international cultural exchange among peers but also drives genuine group inclusion and the transformation of cultural identity.

Teachers as Transformative Mediators and Psychological Counseling Interventions

The substantive efficacy of the transnational support system ultimately hinges upon the professional agency of frontline educators. Giroux (1988) critiques the depoliticizing tendency to reduce teachers to mere "technical implementers," arguing instead that teachers must possess a critical consciousness. Confronted with learners harboring heterogeneous life histories, teachers must exhibit practical knowledge capable of navigating diverse development pathways. This is realized through the precise application of differentiated instruction during academic enrichment and the design of flexible assessments that break free from singular performance metrics.

Furthermore, integrating transnational students into proactive three-tier counseling networks is designed to respond precisely to the psychological alienation woven from language barriers

and cultural dislocations. Teachers acting as transformative mediators must possess the capacity to convert students' “transnational migration experiences” into pedagogical assets. Performance tasks should be designed not merely to audit Chinese language proficiency, but to validate students' capacities to code-switch and navigate meaning across multiple cultures, rendering assessment a tool that confirms student subjectivity and cultural identity.

Conclusion and Suggestions: Toward Resilient and Just Educational Practices

Aligned with the vision of Taiwan’s K-12 Curriculum Guidelines to “nurture every child,” this deconstruction of the adaptation status of primary school transnational students reveals that building educational resilience is not a matter of individual assimilation, but a highly intertwined matrix of institutional arrangement, cultural capital translation, and teacher agency

Conclusion: Shifting From “Deficit Remediation” to “Agentic Empowerment”

Employing the Capabilities Approach as its core analytical framework, this study yields the following primary conclusions:

Geographical Clustering

At the descriptive level, the geographical clustering of transnational students in Taiwan is undeniable. Southern hotspots such as Kaohsiung City bear nearly 30% (29.5%) of the national demand, while the high concentration of students of Vietnamese heritage (40.8%) mirrors the unique intersection of Taiwan's transnational marriage networks and industrial labor structures.

Three-Tiered Institutional Vacancy

At the explanatory level, this study offers a diagnosis of a macro-level lack of demand-driven resource allocation, a meso-level curriculum design that perpetuates monolingual assumptions, and a micro-level pedagogical practice constrained by deficiencies in transcultural teacher training. Together, these vacancies form a systematic barrier to students' substantive capabilities, culminating in “institutional capability deprivation”.

Uniqueness of the Taiwanese Case

From a comparative horizon, juxtaposing Taiwan's situation with Japan's returnee framework and Singapore's integration policies illuminates the uniqueness of the Taiwanese case, where challenges are rooted in the specific family structures following the dissolution of transnational marriages. Consequently, Taiwanese policy must simultaneously address language reinforcement, identity reconstruction, and the repair of family support networks.

Practical Insights and Optimization Recommendations

Establish Dynamic Regional Support Platforms Guided by Spatial Justice

The educational administration should develop a county-and-city-level “Transnational Articulation Service Intensity Index”. This index should integrate indicators such as service hours per student, interpreter allocation ratios, and the accessibility of Chinese remedial

courses to serve as a baseline for the precise distribution of subsidies. The creation of this index fundamentally operationalizes Sen's (1999) conversion conditions into policy, ensuring that students in high-demand zones receive an optimized "conversion rate" of substantive opportunities rather than a superficially equal distribution of funds. Furthermore, Taiwan can draw inspiration from Japan's "Kikokushijo Acceptance School" model by establishing "Transnational Articulation Resource Centers" in schools with high densities of transnational students to optimize interpreter pools and eliminate administrative lags.

Develop Capital-Translating Materials Centered on Intertextual Curriculum Design

Curricular content must actively operationalize cultural border-crossing. Textbooks for core subjects such as science and social studies should systemically pair mother-tongue vocabulary with Chinese terms, creating "intertextual bilingual learning sheets". Teachers can guide students to first grasp concepts in their native language before articulating them in Chinese, elevating "bilingual code-switching" from an informal personal coping mechanism to an academically validated skill recognized by curriculum design. This material not only provides academic language support for transnational students but also guides mainstream students to comprehend Southeast Asian vocabulary, chipping away at classroom monolingual hegemony and overturning the symbolic violence of the deficit model.

Deepen the Professional Empowerment of Teachers as Transformative Intellectuals

Teacher preparation programs must institute "Transnational Transition Pedagogy" as a mandatory professional module, moving beyond technical instructional methods to cultivate teachers' multicultural wisdom and sociological imagination. Additionally, schools should discard traditional, performance-driven neoliberal evaluation metrics, opting instead to embed the tracking and counseling of transnational students within teachers' local "Communities of Practice". Through cross-disciplinary case conferences and collaborative reflection, external administrative burdens can be transmuted into a teacher's internal critical awareness. This is the path to truly realizing the transformative professional agency envisioned by Giroux (1988).

Future Research and International Comparative Value

This study is bound by certain methodological limitations, including its reliance on cross-sectional data, a lack of granular details regarding per-student service volume, and an absence of micro-level ethnographic fieldwork. Future inquiries could be deepened along the following paths:

1. Longitudinal tracking studies could be launched to dissect the precise mechanisms driving the steep drop in student numbers and the adaptive decline observed during the transition from primary to junior high school, isolating the causal relationships behind the academic language support rift.
2. Researchers could collaborate with local departments of education to access administrative records and construct a "service intensity per student" index, directly validating hypotheses regarding spatial resource asymmetries.
3. Qualitative comparative case studies could be developed to evaluate the efficacy of institutional responses across Japan, Singapore, and Taiwan, while exploring how emerging digital learning trends and virtual materials might help students sustain a digital bridge between their home country's culture and Taiwan's educational system outside of physical constraints.

While this study represents only an initial step toward a macro-diagnostic baseline, the three-tiered analytical framework constructed herein offers an indispensable theoretical foundation for liberating future research from the myth of "individual adaptation," moving collectively toward a genuine equality of opportunity anchored in institutional resilience.

References

Banks, J. A. (2015). *Cultural diversity and education: Foundations, curriculum, and teaching* (6th ed.). Routledge.

BERA. (2018). *Ethical guidelines for educational research* (4th ed.). British Educational Research Association.

Chen, J. L. (2005). 臺灣新移民子女學校適應之研究 [A study on the school adaptation of the children of foreign spouses in Taiwan] (Unpublished master's thesis). National Kaohsiung Normal University, Kaohsiung City, Taiwan.

Chen, M. S. (2024). 把SDGs帶進通識教育：以「公民倫理與多元文化」課程為例 [Bringing SDGs into general education: Taking the course "Civic Ethics and Multiculturalism" as an example]. *通識學刊：理念與實務*, *12*(1), 41–86.

Chou, H. C. (2005). 外籍配偶子女學校適應之研究 [A study on the school adaptation of foreign spouses' children] (Unpublished master's thesis). National Taiwan Normal University, Taipei City, Taiwan.

Fu, L. Y. (2004). 誰的科學教育？中小學科學教育的多元文化觀點 [Whose science education? Multicultural perspectives on science education in primary and secondary schools]. *課程與教學*, *7*(1), 91–108.

Giroux, H. A. (1988). *Teachers as intellectuals: Toward a critical pedagogy of learning*. Bergin & Garvey.

Goodman, R. (1990). *Japan's international youth: The emergence of a new class of schoolchildren*. Clarendon Press.

Hong, L. C., & Fan, Y. C. (2022). 評介《看見多元文化教育：過去、現在、未來》 [Review of "Seeing Multicultural Education: Past, Present, Future"]. *當代教育研究季刊*, *30*(3), 97–104.

Huang, C. H. (2019). The schooling adaptation of transnational students in Taiwan: From the perspective of cultural capital. *Journal of Educational Practice and Research*, *32*(1), 35–68.

Huang, C. H. (2019). 淺談文化資本對新住民子女學習適應之關係 [A brief discussion on the relationship between cultural capital and learning adaptation of new immigrant children]. *臺灣教育評論月刊*, *8*(7), 83–87.

Huang, W. L. (2005). 新住民子女在班級中的社會網絡與學校適應 [The social networks and school adaptation of new immigrant children in classrooms] (Unpublished master's thesis). National University of Tainan, Tainan City, Taiwan.

Lai, H. C. (1998). 我國多元文化教育之現況探討 [An exploration of the current status of multicultural education in Taiwan]. *課程與教學*, *1*(2), 95–117.

Lin, I. S. (2013). 閱讀：多元文化教育的議題 [Reading: An issue of multicultural education]. *性別平等教育季刊*, *63*, 12–21.

Lin, C. P. (2003). 臺灣新興的弱勢族群：外籍新娘子女學校適應現況之研究 [Taiwan's emerging disadvantaged group: A study on the current status of school adaptation of foreign brides' children] (Unpublished master's thesis). National Taitung University, Taitung City, Taiwan.

Liu, C. J. (2018). 多元文化融入繪本教學之初探 [A preliminary study on integrating multiculturalism into picture book instruction]. *臺灣教育評論月刊*, *7*(8), 158–164.

Mao, C. J. (2008). 全球化與課程 [Globalization and curriculum]. In Y. S. Ou (Ed.), *課程與教學* (pp. 1–26). 五南.

Nussbaum, M. C. (2011). *Creating capabilities: The human development approach*. Belknap Press.

Ruan, Y. E. (2020). 跨國銜轉學生學習歷程探究—具越南背景跨國銜轉國小學生個案 [An inquiry into the learning process of transnational articulation students: A case study of elementary school transnational articulation students with Vietnamese backgrounds] (Unpublished master's thesis). National Taiwan Normal University, Taipei City, Taiwan.

Saito, M. (2003). Amartya Sen's capability approach to education: A critical exploration. *Journal of Philosophy of Education*, *37*(1), 17–33.

Sen, A. (1999). *Development as freedom*. Oxford University Press.

Sleeter, C. E., & Grant, C. A. (2007). *Making choices for multicultural education: Five approaches to race, class, and gender* (5th ed.). John Wiley & Sons.

Su, L. C. (2021). 多元文化素養 [Multicultural literacy]. *教科書研究*, *14*(2), 127–137.

Su, Y. J. (2011). 教室裡的邊界交疊與跨界的可能性—台灣某專科學院的現場觀察與實驗性作為 [Boundary-overlapping in the classroom and the possibility of crossing borders: Field observations and experimental practices at a technical college in Taiwan]. *教育與社會研究*, *22*, 93–126.

Wang, C. P. (2020). Multiculturalism, interculturalism, and post-literacy orientation: A critical expansion from the perspective of the capability approach. *Journal of Curriculum and Instruction*, *23*(3), 1–27.

Wang, Y. H. (1999). 多元文化師資培育之社會學分析 [A sociological analysis of multicultural teacher education]. *國民教育研究學報*, *5*, 249–269.

Wu, S. T. (2019). Returnee students' dream: Practices and resources for transnational articulation. *臺灣教育評論月刊*, *8*(1), 146–152.

Wu, Y. L. (2007). 多元文化師資培育理論與實務之探討 [Discussion on the theory and practice of multicultural teacher education]. *中正教育研究*, *6*(1), 61–93.

Yang, C. S. (2014). 課程研究與文化研究的跨界連結 [Border crossing between curriculum studies and cultural studies]. *課程與教學*, *17*(2), 1–15.

Yeh, C. Y., Chang, D. F., & Lin, Y. W. (2008). 當前澳洲多元文化語言教育政策之分析 [An analysis of current multicultural language education policies in Australia]. *中等教育*, *59*(2), 22–37.

You, W. L. (2021). 全球化時代教師教學研究、實踐知識與專業發展之初探 [A preliminary study on teachers' pedagogical research, practical knowledge, and professional development in the era of globalization]. *教育研究與發展期刊*, *68*(2), 111–140.

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